

TECHNICAL DEPT.

ROADS AND STREETS

SEPTEMBER 1942

Highway east of Kyburz, in the
vicinity of the Pyramid Ranger
Station, Eldorado County, California

Adams Equipment Now Works to KEEP THE GUNS ROLLING



PHOTO BY U. S. ARMY SIGNAL CORPS



Overwhelming concentration of gun-fire at the right place at the right time is classic battle-winning strategy . . . In today's battles the arrival of American guns at crucial times on world-wide fronts is the climax of a chain of events in many of which Adams equipment plays a vital part . . . Earth must be moved and leveled for factories to produce the guns and for the roads carrying workmen and supplies to them; for camps for the men who use the guns, dockyards for the ships to transport them, airfields for the planes to protect them, and for the all-important roads leading into the firing lines . . . In all these links in the chain of guns rolling to the front Adams machines are swiftly and efficiently doing their jobs . . . After victory new machines designed to meet the most severe wartime performance standards will be ready for your peacetime jobs. They'll be well worth waiting for!

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA
Adams motor graders, leaning wheel graders, elevating graders, hauling scrapers, tamping rollers, bulldozers and road maintainers are used by allied forces throughout the world.



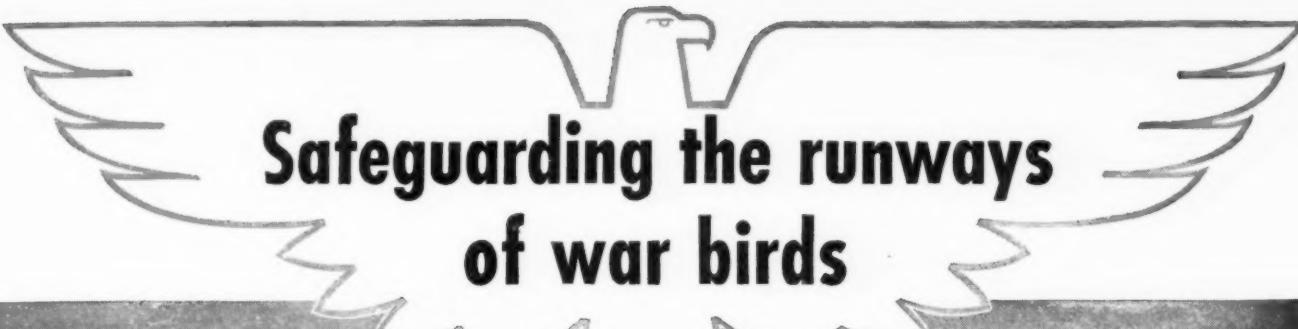
- Adams heavy-duty motor grader builds miles of connecting roads within new ordnance plant in the east.
- Adams hauling scraper cuts, hauls and fills to level ground for motor and artillery park in new western camp.



TO KEEP YOUR EQUIPMENT ROLLING . . .
service and overhaul it regularly. See your nearest Adams dealer
for new machines available under priority rating and for repairs
and service on your present equipment . . . Wherever you are or
wherever you go Adams co-operative service is near at hand.

ADAMS

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT



Safeguarding the runways of war birds



Above is a view of a naval airfield with trainer planes lined up, ready to go aloft. It is typical of the hundreds of airfields scattered throughout the nation, many of them with runways safeguarded with Bethlehem Road Steel.

Embedded in the enormous concrete slabs of many of these runways are Bethlehem Reinforcing Bars and Mats. Though unseen, they are doing a man's sized job in preventing spalling, cracks, and disintegration, despite the sudden strains caused by the landing of

heavy planes throughout the day and night, week after week, month after month.

Bethlehem Road Joints are also used in many of these runways, taking care of expansion and contraction and thus preventing buckling—a serious hazard to aircraft in landing and taking off.

In such ways Bethlehem Road Steel is playing an unseen but none the less important part in helping to win the war.

BETHLEHEM STEEL COMPANY



ROADS AND STREETS

Vol. 85, No. 9

September, 1942

CCA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

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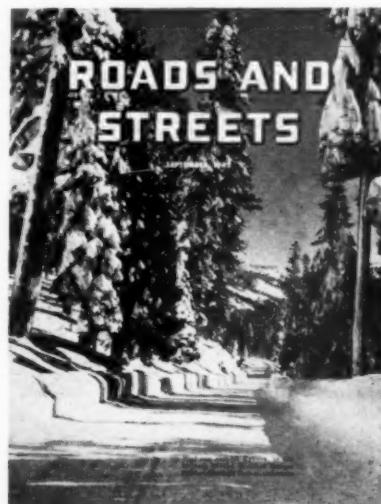
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31

FIRST AID STATIONS to help keep your **LORAINS** **FIRING LINE**

Lorain distributors are out where things are happening—they are our first line of defense to help you do more with what you've got.

Acting as **specialized** first aid stations, they are working 24 hours a day to keep equipment at peak performance and to make it last longer. Call on the one nearest you. Here is what he is prepared to do—

Furnish spare parts: 31 distributors, strategically located throughout the country, carry a representative stock of factory-made parts on hand and can give you quicker service on deliveries.

Rebuild parts in which normal wear is apt to cause trouble. Many Lorain distributors have complete facilities for this work and employ expert service men who know Lorain equipment.

Give on-the-job service: Many distributors maintain service trucks for speedy delivery of parts and field service right to your job. Fewer working hours lost with on-the-job service like this.

Serve as a clearing house for information on rentable equipment or booms you may need for converting present machines.

THE THEW SHOVEL COMPANY
Lorain, Ohio

Write for Thew Handbook

It's a condensed service manual which covers operation, adjustment, care and lubrication. It's packed full of information which every Lorain owner and operator should and probably does know, but a review of these facts will help you get more out of your present equipment—conserve it for the duration and a long time after. Give Lorain model and serial number when writing.

THEW-LORAIN

CRANES
DRAGLINES

SHOVELS
MOTO-CRANES





FRONT LINE MIGHT

rests on rear line constructive power. **CONSTRUCTION MACHINERY** stays longer hours in productive service when lubricated with . . .



... SINCLAIR SPECIALIZED OILS AND GREASES.

These quality lubricants are designed to step up operating performance and step down operating costs.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 WEST CERMAK ROAD
CHICAGO

10 WEST 51ST STREET
NEW YORK CITY

RIALTO BLDG.
KANSAS CITY

573 WEST PEACHTREE STREET
ATLANTA

FAIR BUILDING
Ft. WORTH

A Wartime Service

Will Start in the October Issue
of

ROADS AND STREETS

War has affected every branch of the construction industry—and in no place has this been more noticeable than in the need for longer life, better care and multiple uses for all types of construction equipment.

TO MEET THIS NEED

An entire section in each issue of ROADS AND STREETS starting in the October number will be devoted to CONSTRUCTION EQUIPMENT MAINTENANCE.

CONTRACTORS—

ENGINEERS—

DISTRIBUTORS—

MANUFACTURERS—

**HOW MANY DIFFERENT TYPES OF WORK CAN
THE SAME PIECE OF EQUIPMENT PERFORM?**

HOW — WHY — WHAT TO DO TO GET THE MOST FROM EQUIPMENT AVAILABLE?

WHAT ABOUT REPAIR SHOPS AND MAINTENANCE SERVICES?

The contractor who owns equipment and must make it last "for the duration," or the one who is seeking other uses for it, will be able to turn each month to this Special Section CONSTRUCTION EQUIPMENT MAINTENANCE for practical information. The new buyer and operator, in government services or agencies, will find information on the care and operation of equipment, and kinks from shop and field which he can use to practical advantage.

**THIS IS NOT A NEW MAGAZINE — IT IS A NEW EDITORIAL FEATURE
LOOK FOR IT IN THE OCTOBER ISSUE OF ROADS AND STREETS!**

Subjects to be covered include:

OPERATION — REPAIRS — LUBRICATION — CONSERVATION and all types of MAINTENANCE

Details so well known to the manufacturer that they are taken for granted, may not be known to the man responsible for the first time for construction equipment.

Manufacturers interested in advertising in this section, address inquiries to

ROADS AND STREETS

330 SOUTH WELLS STREET

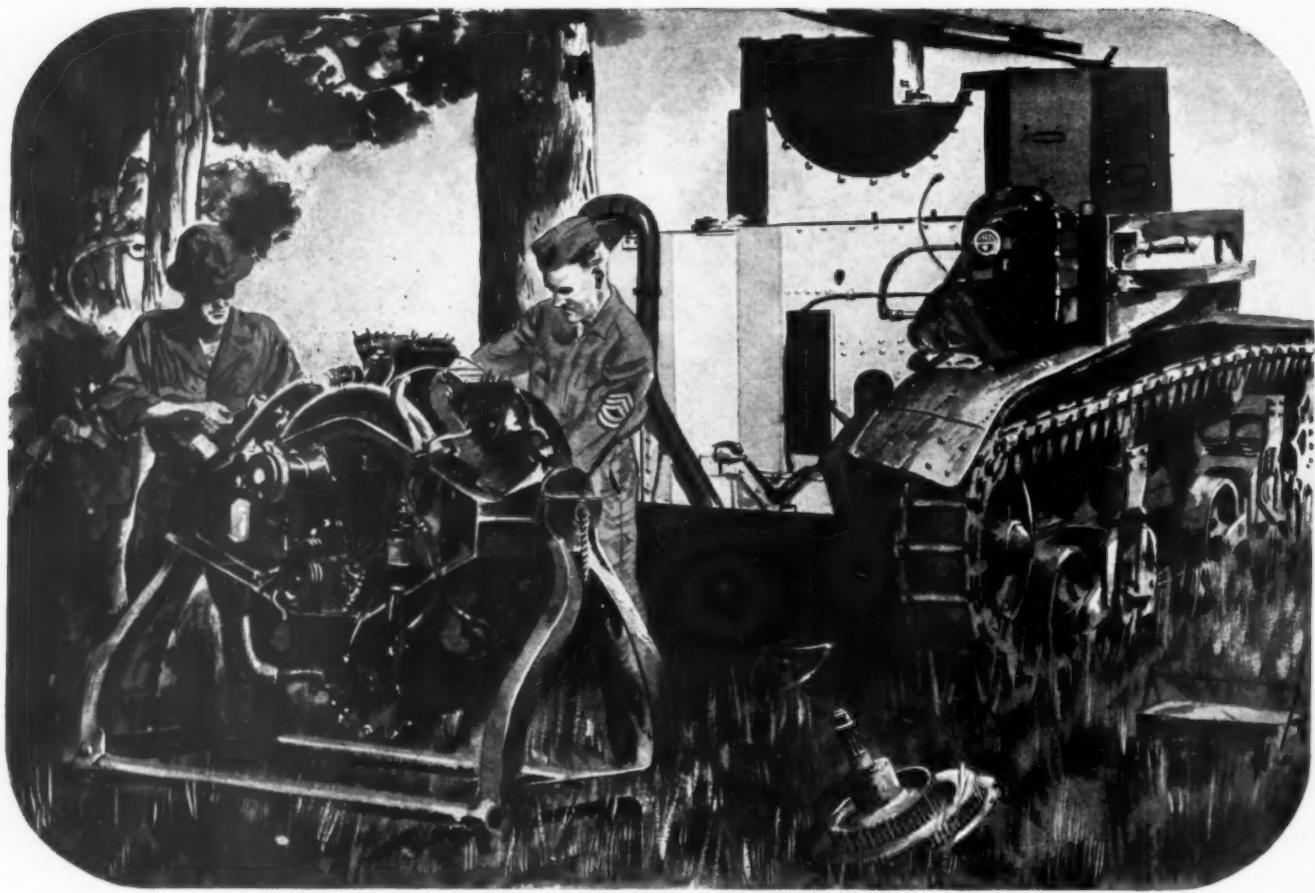
CHICAGO, ILLINOIS

CONTRACTORS
ARMY - NAVY
ENGINEERS FEDERAL
STATE - CITY
COUNTY
EQUIPMENT DISTRIBUTORS

CONSERVATION ROAD

**CONSTRUCTION
EQUIPMENT
MAINTENANCE**

A SPECIAL SECTION OF ROADS & STREETS



His old job IS YOUR JOB NOW

● That boy who had the knack of keeping even your most overworked machine "ticking" is probably now using that knack in the interest of Uncle Sam. Yet never before has it been so important to keep your equipment working at top efficiency.

You who own Austin-Western equipment have the advantage of the extra durability that's built into it. You don't have to baby A-W machines. But you can't hope to get the most out of even the most rugged machines unless you have them serviced promptly and regularly... by men who know exactly what to do... when and where to do it.

Your nearby A-W dealer has this know-how... and the equipment to do a thorough job with a minimum of lay-up time for the machines. Consult him for helpful, constructive suggestions on simple service steps that will prevent many breakdowns, and help keep old machinery performing with new machine efficiency. THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois.



CONSULT YOUR NEARBY A-W
DEALER FOR ADVICE ON CON-
SERVING YOUR MACHINERY

Austin-Western

MOTOR GRADERS • BLADE GRADERS • ELEVATING GRADERS • SCRAPERS • CRUSHING AND SCREENING PLANTS • ROLLERS
ROLL-A-PLANES • MOTOR SWEEPERS • SHOVELS AND CRANES • SCARIFIERS • DUMP CARS • TRAIL CARS

*For Culverts
to serve today
and tomorrow*

USE **Laminex** **PRESSURE-CREOSOTED** **CULVERTS**

If you're looking for a permanent culvert with reasonable first cost and low annual cost—and not a "temporary expedient"—the Laminex* Pressure-creosoted Culvert is tailor-made to fit your needs.

Laminex culverts were developed during the depression, when every dollar spent demanded a dollar plus in value and service.

Laminex culverts are not only

sound structurally, but they are preservatively treated *for permanence* in accordance with standards recognized by engineers for over 40 years. Laminex culverts will not rust, rot, crumble, corrode or chip.

"Laminex" has exclusive interlocking features. It is furnished either in unit members for complete field construction, or in marked sections which can be easily and

quickly assembled by local labor, without hardware.

The Laminex culvert is highly adaptable to all service conditions, and the line includes a variety of needed sizes and capacities. You'll find complete information on Laminex Pressure-creosoted Culverts in the Koppers Technical Bulletin, "Pressure-creosoted Laminex Culverts." Ask for a copy.

KOPPERS COMPANY
WOOD PRESERVING DIVISION
PITTSBURGH • PENNSYLVANIA

*REG. TRADE MARK

use K O P P E R S products

Serving and Conserving



MAINTENANCE-THRIFTY CONCRETE ROADS

America's 100,000 miles of concrete roads are *conserving millions of man-hours of road labor, countless tons of maintenance materials and large quantities of equipment and transportation needed for war.*

Maintenance funds go 1½ to 5½ times farther on concrete. The saving over other surface types ranges from \$57 to \$444 per mile per year, according to a summary of available state highway cost records for recent years.

This is particularly significant because concrete roads in general carry the heaviest traffic.

For today's main-traveled military and access roads, concrete gives the needed load capacity at lowest first cost—requires a minimum of critical materials and transportation in construction—saves money, labor, materials and transportation in maintenance.

Our technical staff is available to assist war construction designers and builders, to expedite work and to develop pavement designs of adequate load-carrying capacity using a minimum of critical materials.

PORLAND CEMENT ASSOCIATION

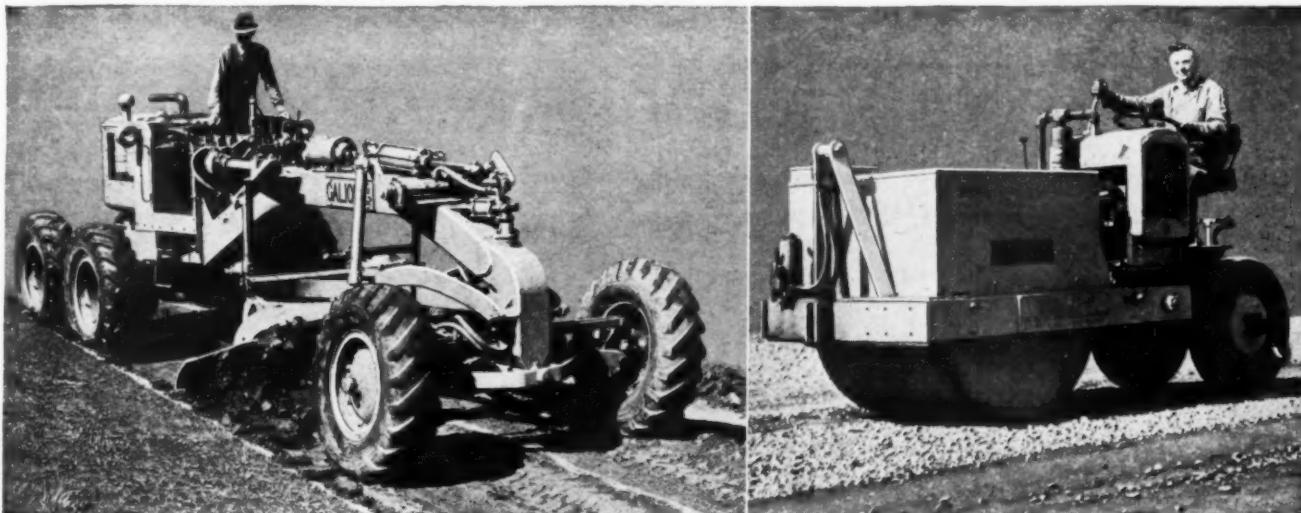
Dept. 9-28, 33 W. Grand Ave., Chicago, Ill.

BUY WAR SAVINGS STAMPS AND BONDS



VITAL WAR CONSTRUCTION JOBS LOOK TO GALION . . .

Galion road machinery is fully occupied in the war effort—our entire output going to the armed forces or to civilian contractors on vital war work. Fast-moving motor graders and road rollers signed up for the duration, speeding construction in airports and cantonments, making the going easier on access roads, around dams and in housing projects. When the final peace is written we hope again to serve you . . . until then, keep your present Galion machines in running order.



THE GALION IRON WORKS & MFG. CO.

Main Office and Works:

GALION, OHIO



Walter Snow Fighters



AGAIN it's check-up time for snow removal equipment! When planning next winter's needs, remember these three important facts:

First: The necessity of keeping roads open for war production, troops and supplies.

Second: The proven record of Walter Snow Fighters in opening highways faster and operating under the severest conditions.

Third: The importance of placing orders early, in view of war-time restrictions, to assure preparedness for the first blizzard.

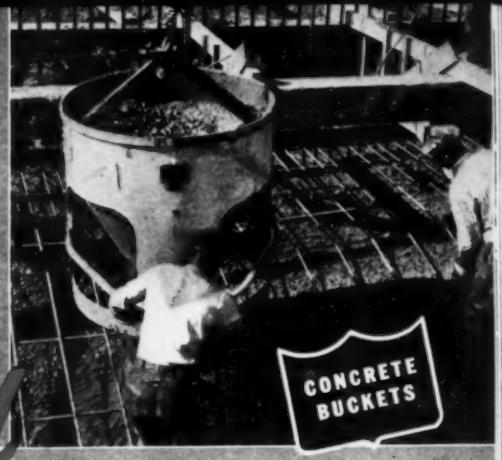
Walter Snow Fighters are especially designed for snow removal. Their tremendous power, traction and ruggedness are provided by the exclusive Walter Four-Point Positive Drive, comprising the following engineering advances: Automatic Lock Differentials



which proportion the torque to each wheel according to its traction; Suspended Double Reduction Drive for larger gear capacity, higher ground clearance and less unsprung weight (maintaining better road contact and reducing wear on tires); tractor type transmission; and many other features. Write today for literature explaining these advantages of Walter Snow Fighters.

WALTER MOTOR TRUCK CO.

1001-19 IRVING AVENUE, RIDGEWOOD, QUEENS, L. I., N. Y.



Step Ahead

Keep the job moving with

BLAW-KNOX

CONSTRUCTION EQUIPMENT

The trouble-free equipment that Blaw-Knox makes is keeping vital construction jobs going at full speed... saving valuable days, weeks and months in the completion of projects necessary for victory.

Every day, construction records are being broken, and Blaw-Knox Construction Equipment helps contractors to do their part.

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
2003 FARMERS BANK BUILDING • PITTSBURGH, PA.
NEW YORK • CHICAGO • PHILADELPHIA • BIRMINGHAM

Representatives in Principal Cities



SPREADEROLLER Applies Wearing Course to Runways, Roads and Streets

The Universal "Chip-Top" Spreaderoller not only spreads material on bituminous treated base and rolls it tight and smooth once over, in a single operation, but it deposits the seal coat in 3 layers—which no truck type spreader or hand spreading can accomplish.

The shaker screen on the Spreaderoller deposits coarse material first, medium size next and chips on top to fill the voids. That's the secret of the smooth, long lasting, high-visibility, water repellent surface you get—no coarse material on top to give that "wash-board" affect or dislodge and scatter to the shoulders.

The thorough amalgamation that takes place makes it unnecessary to screen out excessive chips and dust and lower grades of cut-back can be used—saving in material as well as equipment and manpower.

Surfaces 10-ft. strip of roadway—no detours necessary. Follows right after distributor. Can be used as a regular 10-ton roller, too, on base and binder courses, other asphaltic surfaces and soil-cement mixes.

Spreaderollers are pitching for Uncle Sam on army camps, airports and defense road projects—getting roadways and runways done faster, better and at lower cost.

UNIVERSAL CRUSHER CO.

631 C Ave. West

Cedar Rapids, Iowa

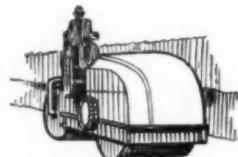
This machine—the Spreaderoller



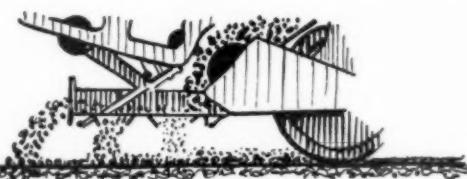
does this operation



and this at the same time



depositing seal coat in 3 layers:



Coarse Medium Chips
1st. 2nd. 3rd.



Send for Bulletin 800A Now!

UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS



Big Carryall Scrapers, like this 30-yard Model RU, really test Power Control Units. You'll find LeTourneau PCU's the almost universal choice of big Scraper operators.

To Users of Cable-Controlled Tractor Equipment **KEEP MEN & TRACTORS WORKING** **with LeTOURNEAU POWER CONTROL UNITS**

Get Easy, Fast Transmission of Tractor Power for Handling Big Loads . . . Avoid Costly, Time-Consuming Delays

More LeTourneau Power Control Units are bought than any 4 other makes combined (picture at lower right shows our 25,000th). Here are a few of the reasons why:

Patented double deck, wide swinging sheaves insure even spooling of cable on drums—no destructive binding or piling. Wide swing of sheaves permit use of larger drums with greater cable capacity; also insure direct pull from tractor to trailing unit at all times. This double deck, swinging arrangement is available only in LeTourneau Power Control Units.

Big capacity—LeTourneau double-drum Power Control Units are built for 30-yard loads. You have plenty of reserve for big overloads, can increase scraper size without changing PCU's.

Easy, safe to operate—Long, convenient operating levers and automatic brakes reduce manipulations and cut

down operator fatigue. Guard around drums protects operator and prevents brush getting into cable drum.

Simple to adjust—Clutch and brake adjustments are in the open where they can be easily reached and quickly made—no lost time for removing inspection plates. When major repairs or parts are needed, you will find LeTourneau-“Caterpillar” dealers in more than 100 cities in America, ready to save you time.

Made in front-end single and rear single, double and 4-drum (for operating Carryall Scrapers in tandem) models. Most models adaptable to all track-type tractors. Husky, easy-to-use cable cutter standard on 2 and 4-drum models. For line pulls, speeds, drum capacities and other detailed information, see your nearest LeTourneau-“Caterpillar” distributor.

25,000 Is a Lot of PCU's

July 25, 1942, the 25,000th LeTourneau Power Control Unit was built and passed its 45-minute test run before going to the U. S. Engineers. This crew has tested PCU's for 3 years, gives every PCU a series of shock tests to insure that they can take the strains you put on them.



6 Years Old—Going Strong

This LeTourneau PCU, owned by Harry Hatfield & Co., of West Virginia, has been in use for 6 years. Says Supt. Frank DeJarnett, “It was used for 2½ years with a Bulldozer, 2½ years with an Angledozer, and a year with a 6-year old LeTourneau 12-yard. During this time it required only a brake band and two brake linings.” Stout, welded cases, heavy-duty gears and bearings, big brake and clutch surfaces make records like that possible, insure you long, time-saving life in your LeTourneau PCU.

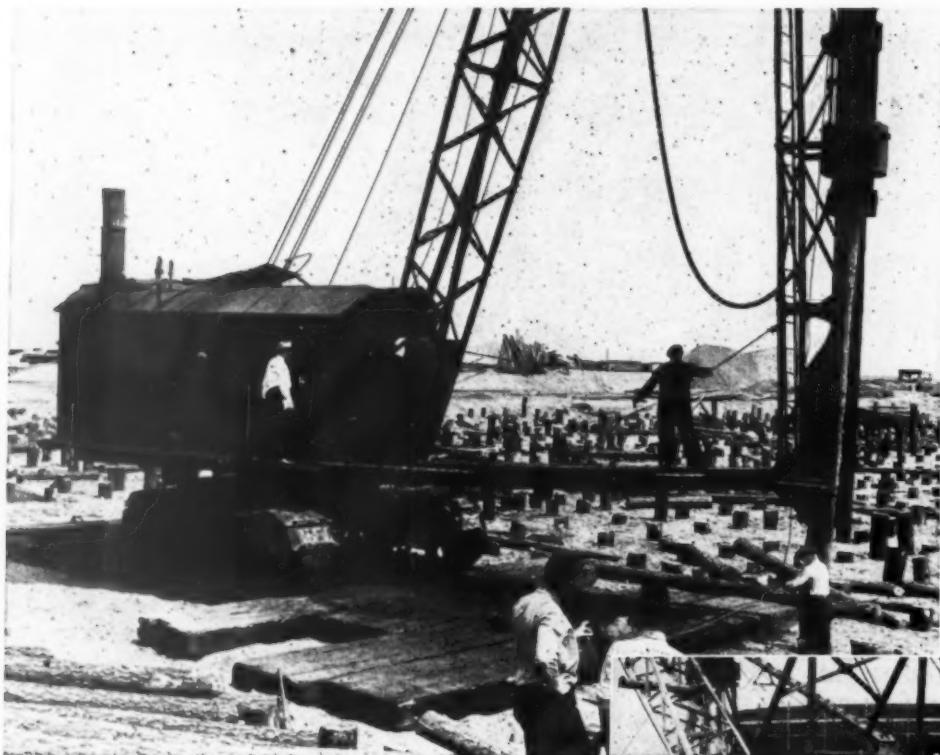


LETOURNEAU
KEOKUK, ILLINOIS — STOUGHTON, CALIFORNIA

Manufacturers of DOZERS, CARRYALL® SCRAPERS, POWER CONTROL UNITS, ROOTERS®, SHEEP'S FOOT ROLLERS, TOURNAPULLS®, TOURNAROPE®, TOURNATRAILERS®, TOURNAWELD®, TRACTOR CRANES. *Name Reg. U. S. Pat. Off.

Gulf Quality Lubricants and Fuels

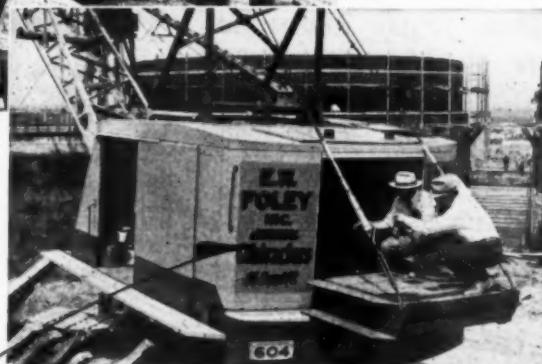
help prevent delays on large sewage disposal project



E. W. Foley, Inc., of New York, N. Y., is the contractor on this \$2,000,000 sewage disposal project, located in Brooklyn, New York. The contractor's operations include excavating, grading, pile driving, form erection, and concrete work. Rapid progress is being made, thanks in large part to the efficient, trouble-free operation of the many units of equipment with Gulf quality lubricants and fuels.

"With Gulf Products in service, we get better performance from our equipment and avoid mechanical troubles"

Says Contractor



GULF lubricants and fuels are a big help on a tough job like this," says the contractor on large sewage disposal project. "Our equipment delivers better than rated performance, and we haven't had a single mechanical delay since we began operations. Since we have a large number of pieces of equipment in service, we believe this is quite a record."

Are you entirely satisfied with the recent operating record of *your* equipment? If not, make sure that on your next job you get the benefits obtained with Gulf lubricants and fuels. Always

of the same uniform high quality, they will help you get top-notch performance from every unit and extra hours of trouble-free service.

Call in a Gulf engineer before you start your next job and ask him to recommend the proper types and grades to meet your particular requirements. The services of a Gulf engineer—and the Gulf line of quality lubricants and fuels—are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.



GULF OIL CORPORATION • GULF REFINING COMPANY
GULF BUILDING • PITTSBURGH, PA.

OIL IS AMMUNITION . . . USE IT WISELY!



NEVER before have Adnun and MultiFoote Pavers been able to demonstrate so conclusively their speed, stamina and dependability as in the gigantic test brought about by War construction. Everywhere that the United Nations are building the bulwarks of Liberty—roads, runways, docks, arsenals, factories, camps, military bases—you'll find Adnun and MultiFoote machines making records under the toughest kind of conditions. On the job 24 hours a day, month after month; as soon as one job is done, moved to another; often handled by new operators and without trained service men—doing a job that is winning acclaim from users everywhere.

Old time Foote Pavers with a new coat of paint and a shot of grease in their bearings are rolling out of dead storage to get in their licks against the Axis. Fast, modern machines are rolling out of the factory faster than ever before to put their shoulders to the wheel on the biggest job of all.

Never before were pavers worked so hard, nor old machines kept going so long. Never before was there such an opportunity to judge their real merits on the job. Watch Foote Pavers today and you will know that they are the machines you will need and want tomorrow.

THE FOOTE COMPANY, INC., Nunda, New York

ADNUN and MULTIFOOTE PAVERS

With Half the World

Ordnance Plant • Hickam Field
Arsenal • Langley Field
Armor Plate Plant • Off Shore Bases • Canadian Air Base
Air Corps Flying School • Canadian Air Base
Airport • Chanute Field • Air Corps Training School
Aluminum Plant • Studebaker Plant • Buick Plant
Hickam Field • Southwest Proving Grounds • McChord
Ammunition Igloos • Goodyear Aircraft Plant • Kingsbury Ordnance Plant • Sheppard Field • Washington National Airport • Manchester Airport • Pratt & Whitney Engine Plant
Langley Field • Guam • Pine Camp • Kingsbury Ordnance Plant • Umatilla Ordnance Plant • Defense Housing Projects • British West Indies Bases
Ellington Field • Aberdeen Proving Grounds • Alaskan Bases • Defense Ordnance Plant • Pratt & Whitney Engine Plant • Naval Shore Establishments • Wheatland Air Force Bases • Niagara Falls • Fort Worth Airfield • Lynchburg Airfield • Portland Airfield • Buffalo • United Nations Forces • Naval Shore Establishments • Wheatland Air Force Bases

as a Proving Ground!

**When BIG LOADS
are MOVED—
ROGERS TRAILERS
are PROVED**



ROGERS BROTHERS CORP.
110 Orchard St., Albion, Pa.

SAVE
TIMECONSERVE
TRUCKS**BROOKS LOAD LUGGER**

Help relieve the truck shortage by mounting a LOAD LUGGER on the chassis and using the Brooks multiple bucket system for loading, hauling and dumping. No need to waste time by standing-by to load up. Just set buckets along curb to be picked up and dumped as fast as filled.



Ask for
CATALOG
No. 44

509 DAVENPORT ROAD
Distributors in all Principal Cities

Brooks EQUIPMENT & MFG. CO.
KNOXVILLE, TENNESSEE

Soil Stabilization

By V. J. Brown
Publishing Director
ROADS AND STREETS

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Texas State Highway Department

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Soil Engineer,
Missouri State Highway Department

E. S. Barber
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U. S. Public Roads Administration

SOIL STABILIZATION

This book is reprinted from a series of articles published in *ROADS AND STREETS*. Demand for the series was world wide. The book treats of fundamentals of soils mechanics and soil stabilization such that the average engineer can get a complete understanding of this new branch of highway engineering.

Profuse illustrations tell more than words could.

141 pages—Hard binding

• Price, \$2.00 Plus Postage

GILLETTE PUBLISHING CO., 330 S. WELLS ST. CHICAGO ILL.

A WORLD-FAMOUS
Chicago Hotel



Distinguished visitors have, by their patronage, made The Blackstone one of the World's most famous hotels. Here, beautiful appointments, quiet luxury, perfect service, excellent cuisine, and sparkling entertainment in the brilliant Mayfair Room—combine to satisfy a notable clientele.

A. S. KIRKEBY, Managing Director

The Blackstone
South Michigan Ave.
CHICAGO

Is your scrap "hiding" from our fighting men?

THE SCRAP SITUATION IS SERIOUS.

Waste materials—scrap metals, rubber, and all the rest—are desperately needed for our war effort. For example, it takes roughly a half-ton of scrap steel and a half-ton of pig iron to make a ton of new steel for vital equipment.

How much scrap is needed?

Six million tons *more* than can be obtained from regular sources of scrap this year. War production will suffer, and battles may be lost unless these *extra* tons are collected by December. But it doesn't stop there. The effort must be continued as long as the war lasts.

All scrap collected will be purchased by the steel industry at government-controlled prices.

Are you set up to do your part?

Do you have a salvage committee for every division and department with an energetic man in charge . . . a salvage "clean-up" day every week . . . a plan to scrap all obsolete equipment and unusable parts?



Remember, no quantity of scrap is too small to be salvaged. Every pound turned in will help relieve the continuing shortage.

We're all in this together and the

only way out is to *get together*. Help speed the scrap collection effort. Do your part. Armclo Drainage Products Association, 905 Curtis Street, Middletown, Ohio. U. S. A.



TURN IN ALL YOUR SCRAP

THIS ADVERTISEMENT IS IN SUPPORT OF THE SALVAGE PROGRAM OF THE CONSERVATION DIVISION OF THE WAR PRODUCTION BOARD.

ROADS AND STREETS, September, 1942



WHEN *You* CAN CONTROL THEM WITH CALCIUM CHLORIDE

Right now, during the fall months, is the time when concrete construction is particularly tricky. Noon-time temperatures of 60° or above can quickly drop to 50° or less before mid-afternoon. Then concreting slows down or stops for the day—unless means have been taken to compensate for the dropping thermometer.

Just a small quantity of calcium chloride (2 lbs. to the sack of cement) puts concrete in a position to ignore temperature changes and forget the time of day. Pouring of concrete can continue to within an hour of closing time, since the rapid hardening action permits finishing to closely follow placing. Schedules can be stepped up, labor saved, and actual reductions in cost effected.

Research at the National Bureau of Standards shows that plain concrete which acquires safe strength in 3 days at 70 degrees will acquire the same strength in less than 3 days at 40 degrees when 2% calcium chloride is added. Thus calcium chloride more than compensates for the drop from 70° to 40°. And the differences in strength between concrete with and without calcium

chloride are even more marked at temperatures of 32, 25, or even 20 degrees.

Bulletin No. 28, titled "Early Strength Concrete," gives all the data from Bureau of Standards reports, and includes numerous examples of field experience on large and small jobs. Every man who places concrete should have this important manual. Write for it today.

TEMPERATURE	DAYS		PLAIN CONCRETE	MORE THAN 28 DAYS
	2% CaCl ₂	7 DAYS		
25°				
32°	2% CaCl ₂	4.6 DAYS	PLAIN CONCRETE	13 DAYS
40°	2% CaCl ₂	2 3/4 DAYS	PLAIN CONCRETE	6.7 DAYS
70°	2% CaCl ₂	1 1/4 DAYS	PLAIN CONCRETE	3 DAYS

Days required for 1:2:4 concrete mix to attain 2000 p.s.i. with and without calcium chloride at various temperatures without cover or protection.

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Bldg., Detroit

CALCIUM CHLORIDE

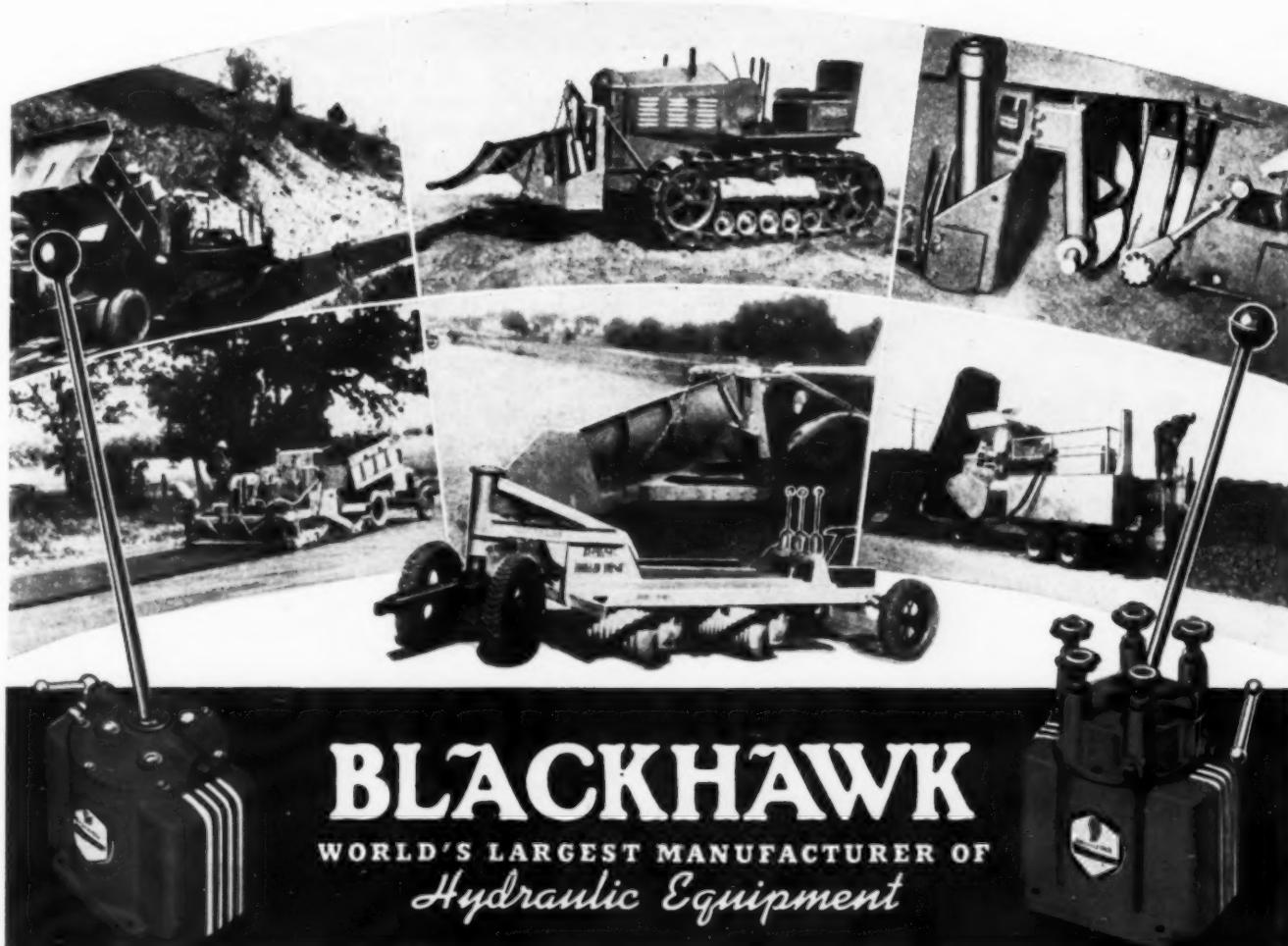
SPEEDS YEAR 'ROUND CONCRETE CONSTRUCTION

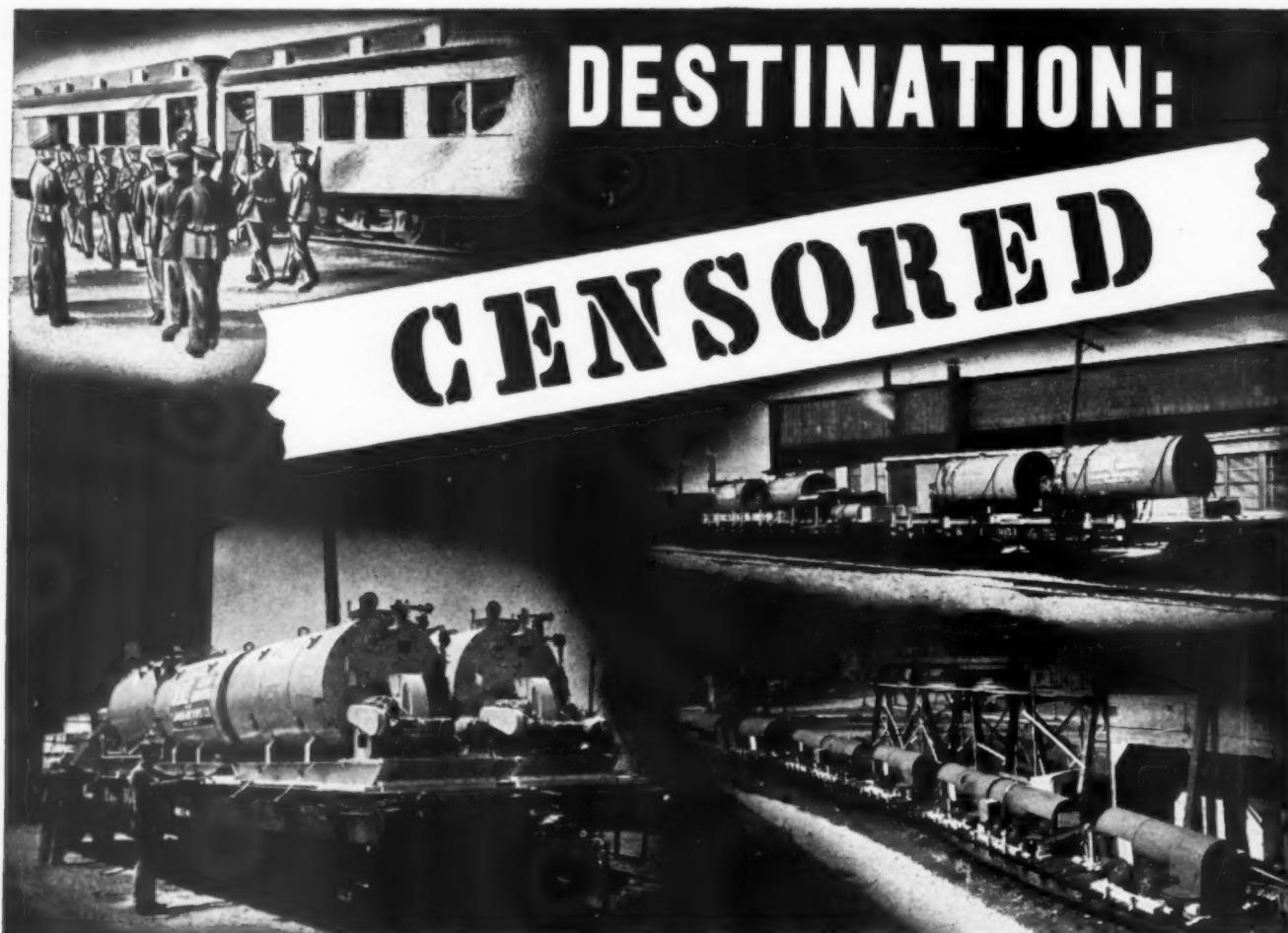


MORE YEARS OF SERVICE IN BLACKHAWK POWER-PACKERS

You're all set to meet the extra demands of the times if your snow-plows and other road machines are equipped with Blackhawk Hydraulic Rams and Power-Packer Hydraulic Controls. They were built for years of dependable lifting power, speedy action, efficiency and accuracy. Give 'em proper care, service 'em right and they'll carry on "good as new" for years. Before winter sets in, be sure to refill all pump units with Blackhawk Winter Oil No. 71—(under no circumstances should brake fluid or other substitutes be used). Check over all units now—and if minor repairs are needed, write for name of nearest Blackhawk Authorized Service Station where you may secure necessary repair parts.

A Product of **BLACKHAWK MFG. CO., Dept. RS, Milwaukee, Wis.**





Scenes of carload shipments like those above are almost a daily occurrence at the Cleaver-Brooks Company plants.

Oilbilt steam generators and Cleaver mobile heating equipment are being started on their way to "unknown" destinations on the far flung fronts of global war as well as bases at home.

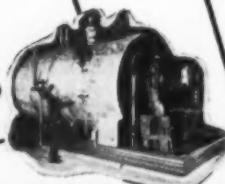
The construction of special steam generating plants — hot water heating equipment — distilling, sterilizing, disinfecting units, employing the use of the proven Oilbilt and Cleaver multi-pass, down-draft, fuel oil heating principle, has long been our contribution to the war effort.

Cleaver bituminous boosters and tank car heaters, too, have played an important part in the swift construction of military roads, airports and runways . . . providing fast, efficient heating of bituminous material in tank cars and storage tanks at lowest cost.

Even though the major part of our production now is allocated to the needs of the military services — such "Victory" effort naturally comes first — we welcome your inquiry concerning the value and advantages of Oilbilt steam plants and Cleaver bituminous boosters and tank car heaters for your future needs.

CLEAVER-BROOKS COMPANY
5106 N. 33rd STREET • MILWAUKEE, WISCONSIN

Oilbilt
STEAM PLANTS



Cleaver
BITUMINOUS BOOSTERS
... TANK CAR HEATERS



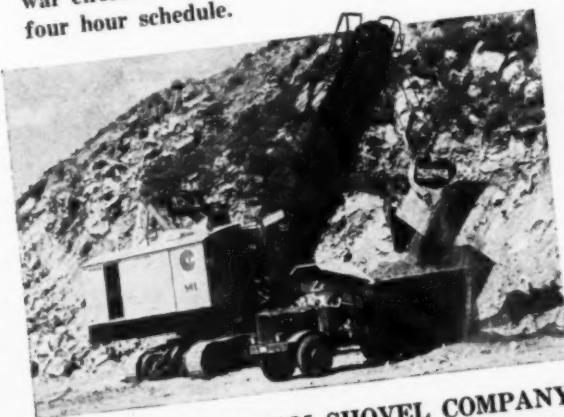
CLEAVER-BROOKS COMPANY • MILWAUKEE, WISCONSIN



So That Free Men May Rule the Skies

"Production and more production" is the battle cry of a free people. They know complete security rests with production supremacy — ability to out-produce the Axis.

Marion machines are playing a vital part in keeping the Nation's assembly lines working at top speed. Their jobs as shovels, cranes, draglines and clamshells are with contractors building military highways, arsenals, housing projects, landing fields, camps and ships, and other construction projects essential to the war effort. This they are doing on a twenty-four hour schedule.



THE MARION STEAM SHOVEL COMPANY
MARION, OHIO, U. S. A. Offices in all principal cities
Serving industry since 1884

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SHOVELS • DRAGLINES • CLAMSHELLS
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Gasoline — Diesel — Electric — $\frac{1}{4}$ cubic yard to 35 cubic yards

FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW



Get This Flag Flying Now!

This War Savings Flag which flies today over companies, large and small, all across the land means *business*. It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow*, keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Pay-roll Savings Plan, *now is the time to do so*. For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW, Washington, D. C.



Save With
War Savings Bonds

This Space Is a Contribution to America's All-Out War Program by

ROADS AND STREETS

AN URGENT CALL FOR SCRAP IRON AND STEEL

6,000,000 EXTRA Tons Needed to Keep War Plants Working

This is more serious than many of us think. To win the war we must have guns, planes, ships, tanks, shells... equipment made of steel... millions of tons of it.

Can we produce the necessary steel? Yes... but *only if* the steel industry receives 6,000,000 *more* tons of scrap iron and steel this year than is available from the usual sources. On the average, about half of every ton of steel produced comes from scrap... every charge into an open hearth or electric furnace is made up in half of scrap.

America needs this scrap *now*. We've got to get it to

the steel mills to keep war production plants operating at top speed. We've got to collect 6,000,000 EXTRA tons of it.

Look around construction yards, garages, supply depots, fabrication shops, highway construction jobs. Gather up those broken gears, axles, wheels, old pipe, castings, worn truck and auto parts, obsolete equipment, plates... And don't forget to look around your own home, too.

Call your nearest scrap or junk dealer. He'll buy your scrap and move it along to the steel mills.

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where it can be read
by every member of
your organization. We'll
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IN CO-OPERATION WITH THE U. S. GOVERNMENT SALVAGE CAMPAIGN
SPONSORED BY: THE TONCAN CULVERT MANUFACTURERS ASSOCIATION, REPUBLIC BUILDING, CLEVELAND, OHIO

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FIGHTING FIRES before they start

Most fires are preventable. A smoldering cigarette, flipped carelessly into a dark corner . . . a welder's spark flying unnoticed into a pile of oily waste—these little things can, and do, start devastating fires.

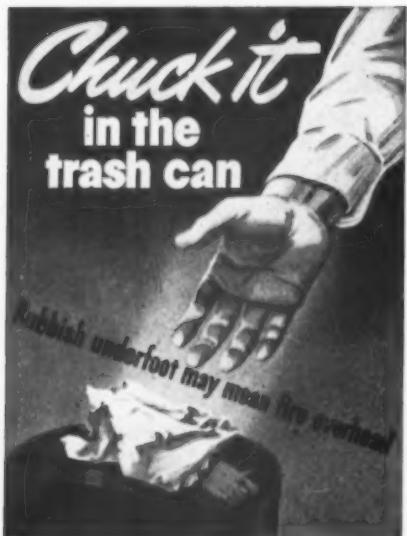
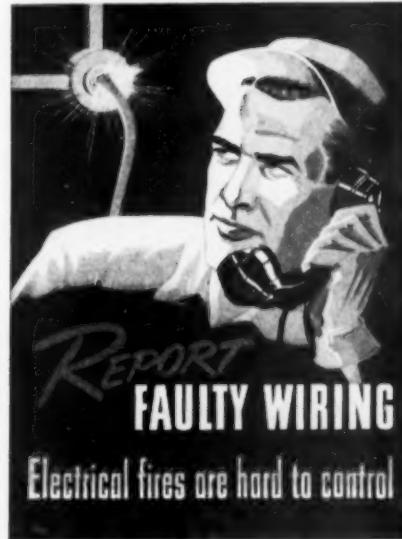
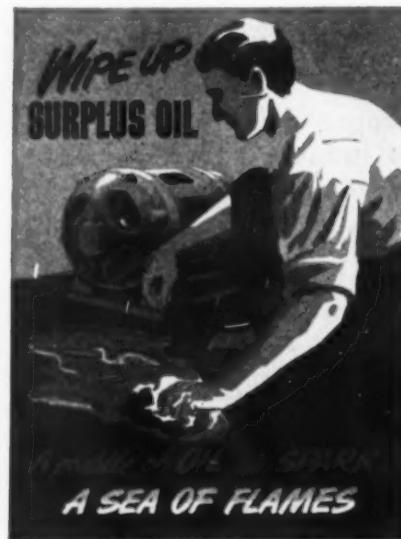
At the beginning of the war emergency, recognizing that fire is a treacherous and deadly saboteur of production, Bethlehem intensified its attack on the fire hazard. As always,

trained, fully-equipped fire-fighting forces supplied the backbone of the fire-control effort, maintaining day-and-night vigilance in every Bethlehem plant and shipyard.

But to bring home the vital importance of fire prevention and control to every Bethlehem employee, we've designed a series of posters in full color and are displaying them in key locations throughout all Bethlehem

shipyards and steel plants, which are now engaged in vital war work.

These posters are based on analysis of the most serious causes of fire and the all-important part of the human element in fire prevention. By pointing out to employees specific ways in which they can prevent or subdue fires, the posters are helping to minimize a potentially grave threat to the production of war materials.



Five of Bethlehem's series of fire-prevention posters. These posters are printed in full color. Each poster is designed to emphasize a specific problem in fire prevention or control.



War-production plant executives who are carrying on fire-prevention campaigns may find these posters of interest. A complimentary set will be supplied on request to Bethlehem Steel Company, Bethlehem, Pa.

Plenty of Reach WITH BUCKEYE DOZERS!



HIGH BLADE LIFT is a mighty handy feature to have in a Trailbuilder. It's a time and work saver when you're chunking out a road or uprooting trees. With a Buckeye, you get up to 72" lift on the larger models and that means the operator doesn't have to cramp his style because he can't get that blade up where he wants it—he has plenty of reach to meet almost all conditions.

Reach is just one of Buckeye's many features. The Buckeye blade digs its own way in and rolls the dirt ahead. Blades tilt 12" by simple adjustment. The unit is balanced for maximum traction efficiency, minimum tractor maintenance. Buckeye Cable Control is fast, powerful and sensitive. All these things mean faster, better performance. Write for full information.

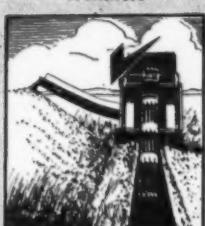
BUCKEYE TRACTION DITCHER COMPANY
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Built by **Buckeye** ✓

Convertible Shovels



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Spreaders



DOUBLE-ACTION SPREADING--



FAST DUMPING CUTS BATCH CYCLE TIME

One second-saving advantage of Koehring Twinbatch and Unibatch Pavers is the Twin-Door Boom Bucket. Twin-doors give instantaneous double-action by both opening, dumping and spreading in the same direction at the same time, without any choking by dry or harsh concrete. This saves valuable time. Here is just one of the features of

Koehring Pavers which cut batch cycle time.



Twin-doors give approximately 13 square feet door opening, dumping in the same direction. Bucket has capacity to carry maximum batch in one trip.



KOEHRING CO., Milwaukee, Wis.

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Utility Plus!

Baker Hydraulic Bulldozers

Tree dozing, stump pulling, dirt moving, filling ravines, building ramps, mowing down glacial ridges—Bakers, the utility earth movers, by the dozen, are doing these things and a lot of others that are not in the blueprints all up and down censored!

Contractors who have used Bakers for years and have had an opportunity to compare all types of earth moving equipment, still praise the Baker's utility.

And much of its plus utility results from the fast, direct, positive hydraulic control. You can jiggle the blade to roll a log as shown above. Or bring the moldboard into play to shove a dirt lugger. And you can hook a *Baker Hydraulic Scraper* on your tractor back end with a *Baker Bulldozer* on the front end. And if you need a winch on the back end, you can have that, too, and still have the utility you get only from a *Baker Hydraulic Bulldozer* or *Gradebuilder*.

Let us send a copy of "Unsung Heroes" which gives a picture account of what Bakers, like these, are doing to win the war.

THE BAKER MFG. CO.

506 Stamford Ave.

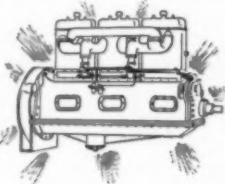
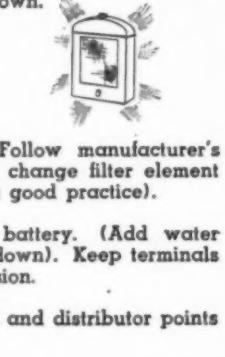
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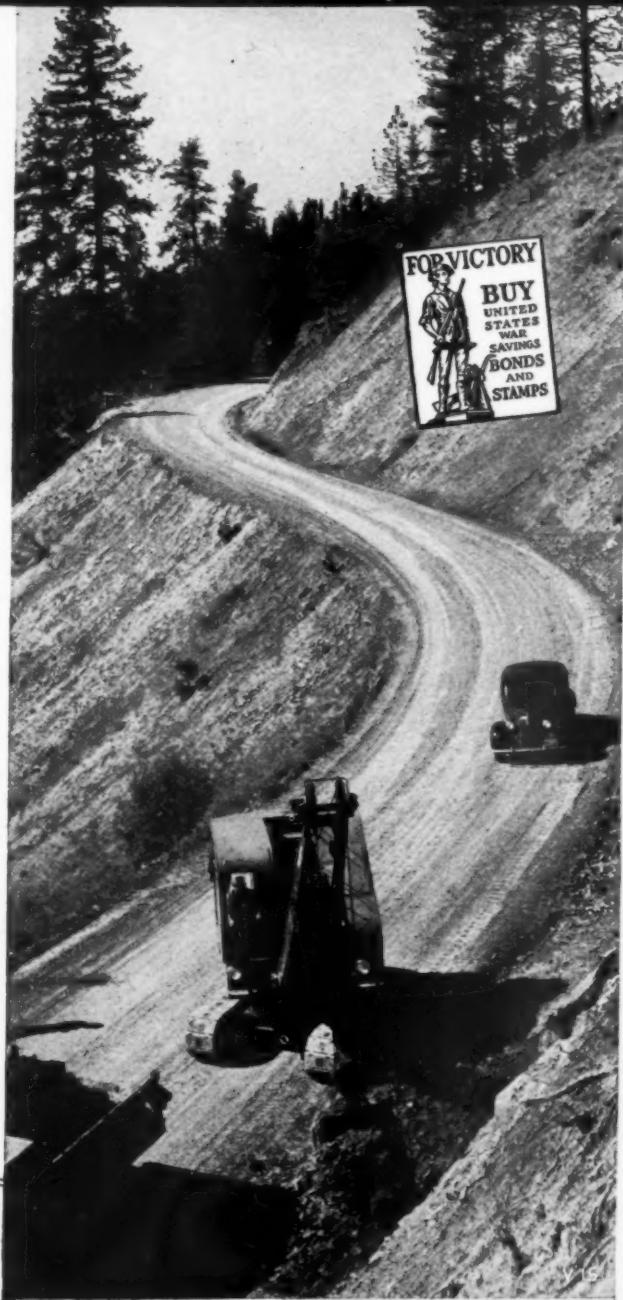
BAKER

The Modern Tractor Equipment Line
for **EARTH MOVING**
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

Keep Your Horses Pulling on the Victory Road

You'll get the most efficient excavator performance when all the "horses" in your engine are pulling full strength. Here are a few hints that may help keep that engine humming.

- 1 Inspect engine regularly and keep it clean. 
- 2 Warm a cold engine up slowly (don't use choke more than is absolutely necessary). 
- 3 Don't stop a heavily loaded engine abruptly. Let it idle a little to cool off before shutting down. 
- 4 Flush radiator out whenever water gets dirty. Be sure water added is clean. Never add cold water to an overheated engine. 
- 5 Use good grade lubricating oil. (Follow manufacturer's recommendations). Clean sump and change filter element frequently (every other oil change is good practice). 
- 6 Keep proper amount of water in battery. (Add water when starting, never when shutting down). Keep terminals covered with grease to avoid corrosion. 
- 7 In gasoline engine, keep spark plugs and distributor points properly adjusted and clean. 
- 8 In diesel engine, check injection nozzle pressures after 300 hours on a new engine, every 1500 hours thereafter. KEEP FUEL CLEAN. Storage tank and transfer containers or pumps should be kept free of both dirt and water. 
- 9 Get complete care and maintenance instructions from manufacturer or distributor, and follow them carefully. 



Bucyrus-Erie

SOUTH MILWAUKEE, WISCONSIN

Enlarged reprints of this ad are available for your bulletin boards. In the reprints, the Bucyrus-Erie signature is omitted to leave room for your own name. Write for your copies.

ROADS AND STREETS

September, 1942, Vol. 85, No. 9

Building Airport Runways of Native Soil and Portland Cement

Speedy Construction and Conservation of Critical Materials in Time of War

CONSTRUCTION engineers during the present crisis are confronted with a problem of stretching the essential materials which go into the building of highways, airports, army camps and various projects to arm this country. Realizing this fact, the writer of this

By C. G. O'FIEL

Chief, Airways Engineering Branch, Civil Aeronautics Administration, U. S. Department of Commerce, Fort Worth, Texas

article has attempted to describe how this was done on an airport project in north central Texas.

An investigation revealed that sat-

isfactory flexible base material for this project was several miles from the site. A few small deposits appeared in the vicinity but not sufficient for the quantities required.

Much thought and study had been made on the possible use of the existing topsoil with an admixture of

View of construction layout. Cement spread, moist mixing and compacting mixture





Setting 6 in. x 6 in. wooden forms



Pulverizing with a tandem disc harrow



Unloading bulk cement from car into the trailer

Portland cement to make a satisfactory runway base. Examples of other projects over the country had given satisfactory service, so why not use it on this one? Representative samples of the topsoil over the proposed site were obtained and tests made on them to determine their characteristics and affinity to Portland cement.

Character of Soil, Proportions of Mix, Total Quantities

The soil varied from a heavy clay loam to a clay, and according to the classification of the Bureau of Plant Industry, was of the Miles-Vernon series. A representative sample of the top 18 in. showed 4% gravel, 16% sand, 49% silt and 31% clay and colloids. Tests revealed a liquid limit of 45 and a plasticity index of 22. According to the U. S. P. R. A. soils grouping, this was classed as an A-7.

The sample representative of the topsoil was tested with varying percentages of cement and put through wet-dry and freeze-thaw durability tests in accordance with the A.S.T.M. method of procedures, to determine the quantity of cement to harden the soil satisfactorily.

It was found that the soil required a cement content of 12% by volume, or 0.54 of a bag of cement per square yard of compacted soil-cement, 6 in. in thickness. It was also found that an optimum moisture content of 19.5% was required to give a density of 103.0 lb. per cu. ft. for the mixture.

A set of specifications were then issued for this project wherein the builder was required to strip the top 9 in. of soil and stockpile it to one side of the runway and taxiway area, to be used later as the finished top 6 in. of the completed runway. All runway and taxiway areas required rolling and compaction of their subgrades according to the moisture-density control method used in the compaction of embankments.

Bids were then advertised for the construction of 189,000 sq. yd. of soil-cement runways and taxiways, requiring 25,515 bbl. of Portland cement. The Uvalde Construction Co. of Dallas, Tex., who had had previous experience on this type of construction were the low bidders and were awarded the contract. Their unit prices were: 33c per sq. yd. for cement, and 28c per sq. yd. for all manipulations.

The Uvalde Construction Co. negotiated a contract with the Halliburton Oil Well Cementing Co. of Duncan, Okla., to do the unloading, hauling and spreading of the cement. All cement was shipped to the delivery point in bulk.

Subgrade Construction

During grading operations it was found that the soil was difficult to pulverize and manipulate due to the high cohesion of the clay. When dry it formed clods requiring a hard tap with a hammer to break them. As these clods were moistened, a plastic layer formed on the outside while the interior was all but totally dry. Even after pulverization there were clusters of soil particles whenever the soil became slightly moist.

The subgrade was compacted with sheepfoot rollers until they traveled on the surface. This meant rolling the subgrade higher than the subgrade grade line, then blading the surface to grade and wasting it on the section adjacent to it, which was in the process of being rolled. Moisture was incorporated, where necessary, to attain the maximum density required.

After the subgrade was finished, the stockpiled topsoil was hauled on to it and bladed into place to a point approximately 1 in. above the theoretical finished gradeline. Later it was learned that about $\frac{1}{2}$ in. would have been nearer correct.

Wooden forms 6 in. x 6 in. were set to grade along the outside edge of the runways, and one line was set along the centerline. This left an area 75 ft. wide between forms, to be constructed. Forms were held in place with iron pins. Specifications called for forms 20 to 30 feet apart but in order to conserve lumber, this was changed to 75 ft. and a trench was used between construction lanes.

Due to the unusual nature of this soil, a few days were spent in determining the best method of pulverizing it before actual soil-cement processing got under way. Specifications required that 80% of the soil, exclusive of gravel, should pass a No. 4 sieve before the cement should be added. At the beginning of pulverizing operations the soil contained 15% to 18% moisture, which placed it in a semi-plastic condition and caused some balling between the No. 4 and the $\frac{3}{4}$ in. sizes during manipulation. Further manipulation would drive out the moisture leaving hardened clods.

Trial sections using disc harrows, turning plows, blades and tillers broke the soil down to approximately 50% of the soil passing the No. 4 sieve. Added manipulation with this equipment did not seem to increase the pulverization at this stage.

Sheepfoot rollers were then routed over a test section, and increased pulverization was noted in a few trips with this equipment. These tests lead



Cement spreader in action



Dry mixing with Seaman Pulvimixer



Water spreading with distributor



to the adoption of the disc harrows, turning plows, blades and sheepsfoot rollers as the most satisfactory equipment for pulverization in the shortest time. This, however, required the moisture content to be at a minimum, or on the order of 5% to 10% of the oven-dried weight of soil.

Hauling and Spreading Cement

Cement had to be hauled 5 miles from the nearest railroad unloading point. It was unloaded from railroad cars with a cement hog, which dumped it into a hopper outside the cement car. A Fuller-Kenyon pump then transported it through a hose into the cement trailers. Then the trailers were hauled to the runway site ready for the cement spread.

Prior to being used on this project the trailers carried cement for oil well cementing. Each trailer had its own unloading device, which consisted of two conveyor screws moving the cement in the bottom of the trailer toward the rear of the unit and then out through a chute. These screws were powered by a gas engine mounted in front of the cement compartment.

In order to spread the cement uniformly and to a required amount per square yard a spreading unit was built, which could be attached to any of the trailer units. This machine consisted of a batch box, agitator bar, control mechanism and conveyor screws, arranged in a manner to give satisfactory results. It spread the cement in a strip $7\frac{1}{2}$ ft. wide. Each trailer contained enough cement to cover an average distance of 375 ft.

When the cement spreader had made two round trips, dry mixing was begun on the first 25 ft. section. The area 75 ft. in width, to be processed each day, was divided into three construction lanes. As soon as lane No. 2 was covered with cement, Seaman Pulvimixers began the dry mixing operation. Water spreading and moist mixing started on No. 1. Later in the day, the tillers or mixers would be dry mixing No. 3; the same units would mix the soil-cement and water on No. 2, while the sheepsfoot rollers were compacting lane No. 1.

One pass through the section with the mixers was followed by two 3-

bottom, 14 in. moldboard plows, pulled by crawler tractors. The plows turned the soil-cement mixture adjacent to the subgrade, toward the surface, and the mixers were again routed through it.

Sprinkling, Mixing and Compacting

After completion of dry mixing operations, samples of the mixture were obtained by an inspector, and tested for the amount of moisture present. From this data the paving inspector would determine the necessary amount of water to add in order to obtain the density specified at the time of sheepsfoot rolling.

Practically throughout the construction of this project, the contractor was confronted with high temperatures and high winds. Hygroscopic moistures amounted to percentages from 5 to 8, on the average. The optimum moisture requirement varied from 19% to 21% of the oven-dried weight of soil-cement mixtures. To this amount had to be added moistures of 4% to 6%, to allow for evaporation losses.

Realizing the need for speed in the addition of water to attain increased yardage of construction, the contractor set up a 12,000 gal. storage tank near the runway site. Water was hauled in by feeder tanks and emptied into a stock tank, from which it was pumped into the storage tank. On the opposite side of the storage tank, a 6 in. pipe, with valve, was installed to fill the distributors to be used for the water spread. With this size outlet pipe it required only a minute to fill the 1,000 gallon distributor.

Three distributors, each of 1000 gal. capacity, were used in the application of water to the sections to be processed. Occasionally one of these distributors applied water to the straw cover material used for preserving the moisture in the soil-cement sections already completed. Spray bars were wide enough to cover the entire width of construction lanes.

As each distributor moved onto the section it was followed by the mixers, which incorporated each additional increment of water. When the soil-cement mixture became slightly sticky, the 3-bottom gang plows were employed to turn the mixture over, thus transferring drier material from the bottom toward the top. These operations were repeated until the required amount of water had been added. Mixing continued until the soil-cement mixture was uniform throughout, then left in a loose condition for the packing operations.

Specifications called for a density

- Sampling dry mixture
- Moist mixing operations
- Turning mixture with plows
- Visual inspection of mixing

to within 5 pounds of the theoretical density obtained by the standard compaction test at the time of sheepfoot rolling. Four double-drum sheepfoot rollers were used to attain these densities. Two of them were filled with sand and water, and rolled the section until they started packing out of the mixture. They were pulled by a crawler tractor. Then the remaining two double-drum sheepfoot

ing grade was used, as it was found to be speedier and very accurate. A portable field laboratory was used to conserve time and as a convenience in testing.

Record of Operations

In order to visualize more clearly the sequence of an average day's operations, the following is taken from the inspector's daily record book:

OPERATIONS	STATION 31 61			TO STATION 22 88			SQ. YD. 7,392
	WATER 66,700 GAL.			CEM. 1,014 BBL.			
	LANE No. 1	From To Hrs.	LANE No. 2	From To Hrs.	LANE No. 3	From To Hrs.	
Cem. Spread	1:45- 3:30	1 1/4	4:00- 7:30	2 1/2	9:00-11:30	2 1/2	
Dry Mixing	6:00- 6:30	1/2	7:45- 9:00	1 1/4	11:30-12:45	1 1/4	
Water Spread	6:30-10:00	3 1/2	9:15-12:00	2 3/4	11:45- 4:00	4 1/4	
Moist Mixing	6:30-10:15	3 3/4	9:15- 1:30	4 1/4	12:00- 4:15	4 1/4	
Prelim. Pack.	10:20-11:20	1	1:15- 2:45	1 1/2	4:45- 5:45	1	
Prelim. Shap.	11:15-11:30	1/4	2:45- 3:30	3/4	5:15- 5:45	1/2	
Final Pack.	11:30- 1:15	1 1/4	2:45- 4:00	1 1/4	5:45- 7:45	2	
Final Shap.	1:15- 3:00	3/4	4:00- 4:30	1/2	7:15- 8:00	3/4	
Broom Drag	3:00- 3:15	1/4	5:15- 5:30	1/2	7:45- 8:15	1/2	
Final Rolling	1:30- 3:30	2	4:15- 5:45	1 1/2	7:45- 8:45	1	
Covering	3:30- 4:30	1	6:00- 7:00	1	9:00-10:00	1	

rollers, filled only with water, were routed over the section to assist in compaction. The latter two rollers, hitched in tandem, were drawn by a pneumatic-tired tractor.

Finishing Operations

After rollers had packed about two-thirds of the soil-cement mixture, a motorgrader was brought in to shape the section. Following this procedure, both rolling units continued compaction.

When rollers had packed out to a surface slightly above the proposed grade line, the motor grader again shaped the section, but this time the surface was bladed to the finished grade given on the plans. The excess material was wasted onto the adjacent section, which was in the process of water spreading and moist mixing. Excess material on lane No. 3 was bladed to one side, and wasted.

Finishing procedures consisted in scratching the final bladed surface with a heavy wire bristle broom-drag, followed by several trips with a pneumatic-tire roller. Light applications of water were added from time to time to supplant the moisture loss due to the high temperatures and wind. Pneumatic-tired rolling continued until the surface was well knitted together and sealed. Straw from nearby fields was used as the cover material, and kept moist for a period of seven days, prevention of evaporation being imperative.

Engineers and inspectors kept rigid control of the moistures, depths of treatment and densities obtained. Line and grade were checked very closely. The T-stake method of check-

Since the day's schedule was based on a fifteen-hour day, enough inspectors were employed to make two shifts. The engineering personnel consisted of the following men:

- 1—Project engineer
- 1—Assistant project engineer
- 2—Laboratory technicians
- 2—Assistant laboratory men
- 2—Paving inspectors

Thirty-seven days of actual processing completed the 190,000 sq. yd. of soil-cement runways and taxiways, or an average of slightly more than 5,000 sq. yd. per day. Approximately 25,850 bbl. of cement were used. Unusually high winds and high temperatures during construction necessitated more water than had been anticipated. With a friable A-2 or A-3 soil, this same project could have been completed in approximately twenty working days.

Personnel

The contractor's personnel consisted of a general superintendent, L. L. Cooper; field superintendent, Sam Foster; and general foreman, A. E. Johnson.

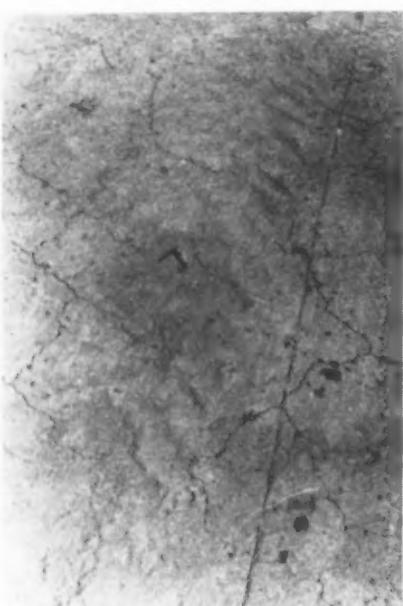
The Civil Aeronautic Administra-



- Preliminary shaping with a motorgrader
- Final packing and removal of compaction planes with a spike-tooth harrow
- Final blading operation
- Light application of water prior to broom-drag and pneumatic-tire rolling



Making density test: Sand method



Close-up of finished base, prior to placing bituminous mat, showing crack pattern typical of heavy clayey soils

tion's field personnel was represented by H. G. Karges, Airport Engineer; Sam Fritz, Assistant Airport Engineer; Frank Kleiner, Laboratory Technician; A. D. Skinner, Laboratory Technician; Paul Burwell, Paving Inspector and E. T. Smith, Paving Inspector.

The writer spent considerable time in personal supervision and inspection. In his opinion, this work was performed strictly in accordance with plans and specifications; and it may be added that the most rigid control and inspection was performed by the engineering personnel at the site. It is firmly believed that the soil-cement base will prove to be entirely satisfactory in meeting the requirements for the type of airport for which it was designed.

An incidental advantage of this type of construction in comparison with other types in the same cost range was a substantial saving in the use of rubber tired trucks and other rubber tired equipment.

The soil-cement runways and taxiways were not constructed to withstand surface abrasion, and at the time of this writing, are receiving a wearing surface of a light grade of bituminous prime, to be followed by 1 1/4 in. of rock asphalt.



The Author

whether or not the equipment is operating efficiently and economically, if it has been using excessive oil and fuel and if it has been greased properly. The motor is tested with an exhaust analyzer for correct carburetor adjustment and given a very thorough check up. A report is then made to the chief mechanic, who decides definitely what repairs should be made, in case the machine is not operating properly and whether or not it has been given reliable attention by the operator.

We are fortunate in having an exceptionally well equipped highway shop which is, of course, very necessary in efficient maintenance and operation of equipment. In case of emergency, we have made various parts that were difficult to obtain without considerable delay, and this year, due to war regulations, we have been repairing and making parts in a big way.

Our county shop was planned and constructed, so that the main office and stock room would be in the same building where the major repairs are made and also have the supplies, parts and records of such repairs in the same building. This arrangement provides a very definite check on repair parts, supplies and labor necessary to make the equipment repairs.

The cost of repairs and actual operating costs of each unit of equipment is kept separately and we definitely know from our monthly and annual reports, whether or not each unit is operating efficiently and economically.

Our shop crew consists of 1 Chief Mechanic, 1 Stock Room Clerk, 3 Mechanics, 1 Blacksmith and Welder, 1 Painter, 1 Gas Truck Operator and 1 Night Watchman and these nine men efficiently maintain 87 units of construction, maintenance and snow removal equipment.

W. R. Elden, Manufacturers' Representative, Dead

William Robert Elden, manufacturers' representative of New York City, died on Sept. 2, aged 59. Following his graduation from Purdue University in 1905, Mr. Elden was a sales engineer for Lidgerwood Manufacturing Co. until 1921, when he joined Sauerman Bros., Inc., of Chicago, where he remained as Chief Engineer until 1939. In 1939 he opened his own office in New York City to represent Sauerman Bros., Inc., and other manufacturers of material-handling machinery.

The Equipment Maintenance Set Up of Oconto County, Wisconsin

Mr. C. L. Foley, Highway Commissioner of Oconto County supplies the following outline of equipment maintenance methods in his organization.

When equipment operates efficiently, give your mechanics and operators credit and when it doesn't you can occasionally trace the trouble back to negligence. We have overcome neglect by rigid rules and individual responsibility.

We have reminder signs over each shop exit and each patrol shed which read, "Has your equipment been checked for oil and grease to-day?" Also have the same reminder placed on each unit of equipment where it can readily be seen by the operators, for instance, on the lower left hand corner of the windshield on Trucks

and Power Graders. All our Power Graders are on active duty on various sections of the county highway system all year and with the exception of major repairs, the maintenance of these eleven units is left entirely to the operators. They are inspected monthly by a mechanic and are taken to the main shop twice a year for a complete check up, painting job and any repairs that are necessary at that time.

The monthly inspection is made by mechanics from the main shop, who have the previous month's report from the operator of each unit which shows the miles traveled, hours of operation, fuel, oil and grease consumed and minor repairs made that month. The check up consists in determining

Cranes Speed War Work

THOUGH not labeled "for defense," each of the jobs here illustrated (two bridges and a coal tipple) will, when finished, serve our Nation's total war effort.

The cranes (General Excavator Company's "Supercranes") are interesting not only for the work they are doing, but because they are a modern outgrowth of the truck crane, which was developed during World War I. That unit, as some will remember, was a small affair, mounted on a solid tired "Liberty Truck" chassis. In comparison with predecessor equipment it afforded distinct advantages—especially in mobility—and its rapid acceptance which naturally

Opening up a bottle neck in Ohio. Here Henry Selinsky, of Canton, uses an extra long boom in erecting a coal tipple near Cleveland. Note how the wide wheel gauge provides resistance to overturning

followed was not at all unexpected.

Twenty-five years' development has brought us to such units as those pictured here. If some Rip Van Winkle operator could be confronted with one, he would marvel perhaps first at the tires and then at the length of boom. Self-propulsion and hydraulic steering would fascinate him, but what would "get" him most would, in all probability, be the fact that one man, in one spot, operates everything. Rip's face would be a study for Hollywood.

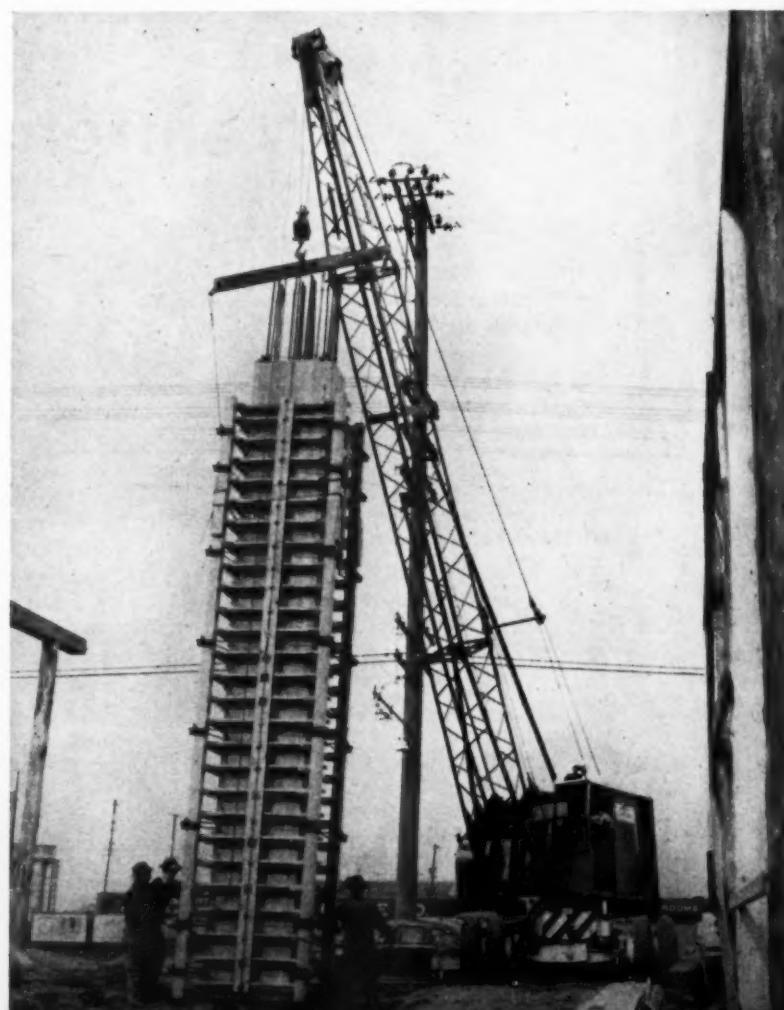
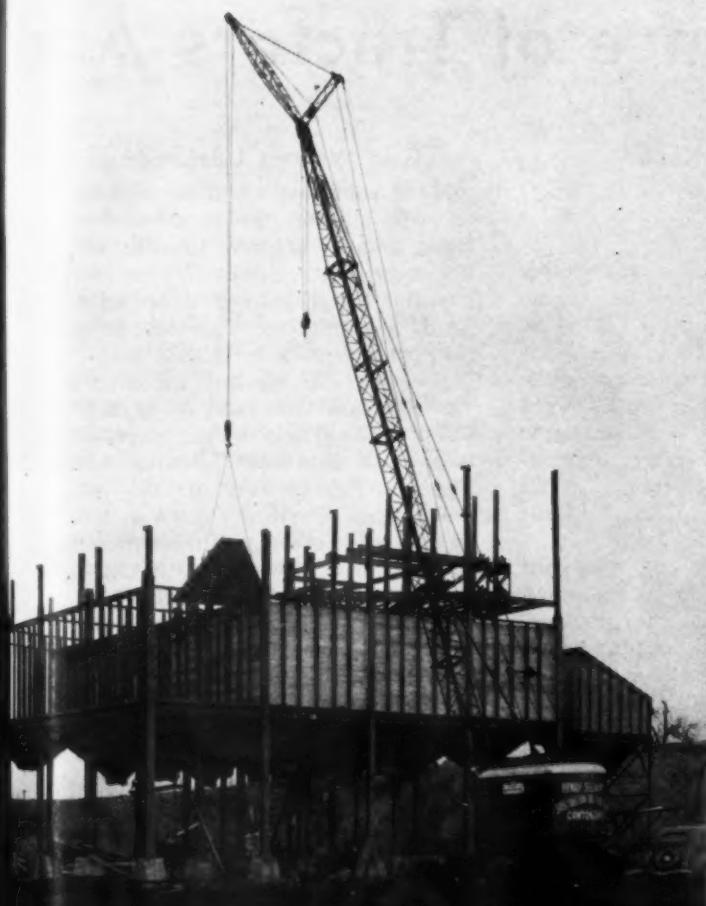
In connection with the war effort, it is worth noting that cranes of this type are actually in service at the front, where their wide

On the new Spokane St. viaduct in Seattle this crane takes a 29-ft. column form and reinforcement off truck and sets it accurately in less than 15 minutes. Weight, 10,000 lb. McRae Bros. are contractors



This machine, owned by The Jensen Construction Company of Des Moines, Iowa, handles a pile driver on bridge foundation work. The mud here was unpleasant but not an obstacle

spacing and extreme maneuverability enable them to negotiate terrain which is difficult for many smaller and apparently less cumbersome machines.





Maintenance of cable equipment on the 'dozer pays big dividends. Grease the sheave bearings regularly



When changing the crankcase lubricant, drain the oil filter. Don't fail to change the element as recommended

Maintenance of Tractors And Tr

OUR of the major phases involved in adding extra years to your tractor's economically useful life were covered in the preceding article (pages 40-43, ROADS AND STREETS for August). Lubrication, care of the cooling system, care of tractor fuel and maintenance of accessories all come under the head of progressive upkeep.

When the Tractor Stands Overnight

But in the field of actual operation there are several points of equal importance. First, let's review a few in the general operating line. When the tractor has stood overnight, the protective film of oil covering moving parts has to a certain degree run off, and to restore this before damage occurs, it's a good idea to run the engine at half throttle for a few minutes.

By ASA LINDLEY

Part II

Check the oil pressure gauge, too. Proper pressure, at rated engine speed, is usually 30 if indicated in pounds. On some types the correct pressure is indicated when the needle is within "Operating Range." Marked falling off of pressure at rated engine speed is invariably a sign of impending trouble. Failing oil pump, low oil supply or worn out oil may be indicated.

Tractors standing out overnight should be protected in several ways. For example, always cover the exhaust pipes to keep out moisture. Cover the machine with a tarpaulin if it's convenient. And if the weather drops below freezing, be sure you use an anti-freeze solution.

Cold Weather Lubrication

Many contractors will be working on projects where the temperature is lower than ever before in their experience, as the needs of war construction call them away. Hence a few words about tractor maintenance in cold climates may be valuable.

Necessity for selecting the proper viscosity lubricants was stressed in the previous article; we're reiterating it now, as it is most essential. Too heavy lubricants won't do the job, and if they are used the effect will be nearly the same as if no lubricant was employed. Take out the S.A.E. 20 in the crankcase and refill with S.A.E. 10. Shoot the chassis fittings with lube oil if your job is in a sub-zero part of Alaska. Use S.A.E. 80 or 90 in the transmission and final drive cases, or cut the heavier oil with kerosene.

Anti-freeze—Fuel—Starting

There are a number of good anti-freeze preparations on the market. If an alcohol solution is used, remember that alcohol evaporates during the operating time. Therefore, the correct time to check the gravity of the anti-freeze solution is at the time of shutting down, unless the operation is on a 24-hour basis. This tells you if the anti-freeze is up to strength and necessary addition of the preparation can be made to protect the cooling system during the time the engine will be stopped.

If it's cold enough, you may have trouble with your fuel, so be sure that the distillate has a low enough pour point. And if your tractor has a spark-ignition starting engine, there's a better way to get it going under adverse conditions than the venerable cylinder priming method. Remove the spark plugs and if they are damp, pour gasoline over the electrodes and light it. This dries the plug out effectively. Then pour a little more gasoline on the points and replace them in the engine. When you prime the cylinders the old way, you risk washing away the protective oil film and the cylinders may run dry for several revolutions.

In Slush or Mud, Keep 'Em Rolling

Every contractor has operated his machines in deep mud or slush. Now, when work must continue come hell or high water, it's going to be an every-



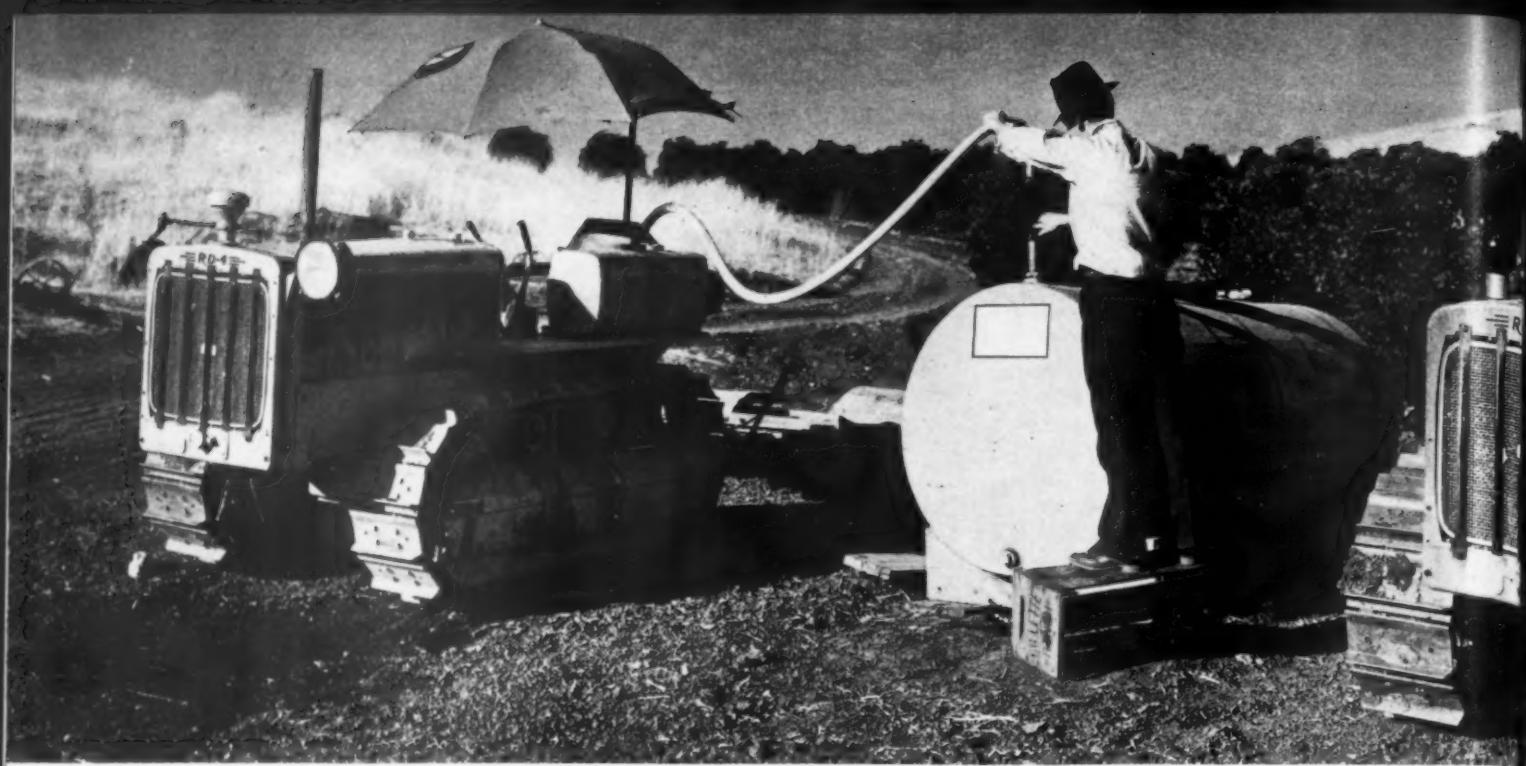
Track mechanisms must undergo gruelling service. Check rollers, carriers and idlers frequently, and lubricate them with the proper grease at regular intervals.



Tractor Units

day experience. It doesn't take much imagination to picture what will happen to the exposed parts under such conditions unless special care is exercised. The track rollers and front idlers bear the brunt of the abuse; they should be lubricated every five hours. And drain out a little of the lubricant from the final drive cases frequently. If you find dirt or water present—and you well may—check the seals. They may be broken. Replace them, flush the case out and fill with new oil. There are expensive gears, bearings and other parts in the final drive cases; allow dirt to remain for any substantial period and you're in for a costly repair job.

If it's a new tractor, run it under light load for 50 or 60 hours—the equivalent of "breaking in" a new automobile. See that your operators keep their feet off the pedals. Brakes are for helping turn or stop the trac-



This fuel storage tank will add many hours to the life of the owner's diesel engine

tor, not for foot rests. And, while on the subject of operator's care, tell your cat skimmers to engage the power control unit clutch firmly and quickly, and immediately return the lever to the opposite side. This prevents overheating and wear on the clutch fac-

Consider Your Rope and Hydraulic Units

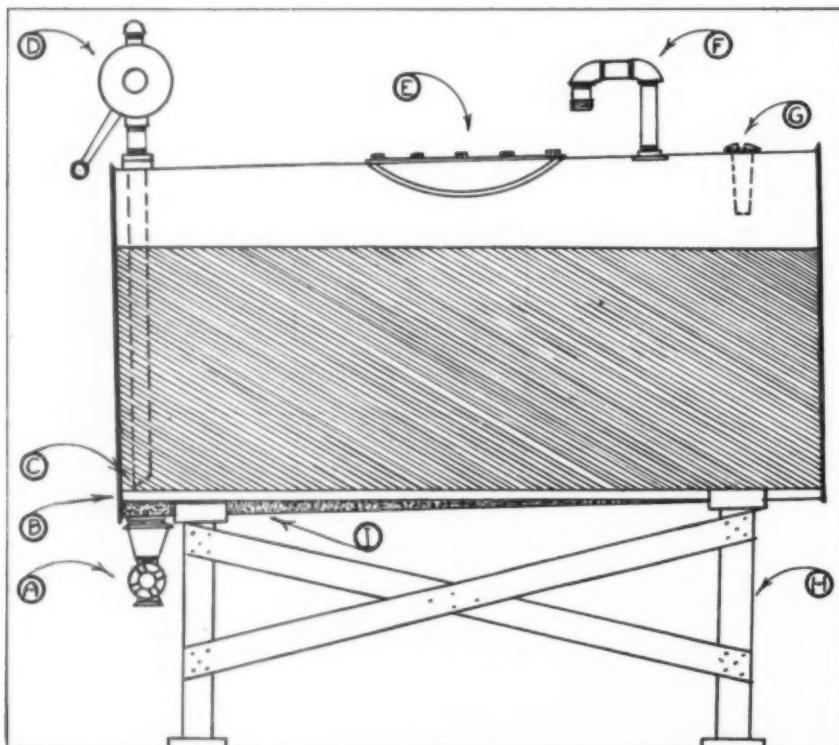
And stress the importance of applying the power gradually to a taut line. Power applied to a slack line often snaps it. This rule, of course, is bound to be violated occasionally, and the use of preformed wire rope will pro-

vide an extra margin of safety against possible shear breaks. Due to the pre-forming process, each wire has exactly the same load bearing quality as the next, and therefore is less likely to fail under torsional stresses. Pre-formed wire rope has still another advantage from the worker's standpoint. Because it is more flexible, the operator can reeve it much faster. And because its strands are inert, it can be cut to the proper length without wasting time seizing the ends first.

Here's another operating kink which will prolong the life of a hydraulically operated bulldozer: tell the cat skimmers to carry the 'dozer at the midway position in its operating arc—neither up nor down. By so doing, there is a hydraulic cushion in the cylinder on either end of the piston. If the blade is carried in the fully raised position, for example, the piston will be all the way back and resultant metal-to-metal contact will cause wear.

At the End of the Day

A few simple tasks performed each day will pay big dividends in uninterrupted operation of the equipment. Several of the larger contractors have adopted a regular routine at the end of each day's work. First, they check the water in the radiator, then they fill the fuel tank. Not just part way, but full. Too few operators realize the importance of this measure. First, it drives out air and prevents condensation and its corollary, rust. Second, it allows for settlement of impurities in the fuel. Just before the engine is



Use of a large diesel fuel tank will add appreciably to the life of your equipment. Here is a well-designed tank. "A", the drain cock; "B", accumulated water; "C", terminus of the outlet pipe three or four inches from the bottom; "D", hand operated pump; "E", manhole for cleaning; "F", air vent; "G", filling hole; "H", solidly built standard; "I", accumulated sediment

started again, the drain cock is opened and water and sediment allowed to run out.

The next move is a quick check for worn or broken bolts, nuts, capscrews or parts. Particular attention is paid to the capscrews on the track roller brackets and the equalizer spring clip nuts. These units undergo immeasurable vibration and constant strain, and if they are allowed to remain loose they are certain to fail quickly. Points where gaskets are installed are inspected at the same time, and any loose nuts are tightened.

Some construction jobs have facilities for steam cleaning of tractors and other equipment. This is particularly feasible when the project is very large and the contractor has set up a more or less permanent camp.

Still another point to remember, provided the machine is operating on a 24-hour basis, is care of the starting engine. It can be kept in good condition by running it a few minutes each day to eliminate condensation and restore oil film. Where electrical starting is employed, watch the battery as carefully.

If Your Tractor Goes to Sea

It seems unlikely that much equipment will be stored during the war, but many a unit is going to take a long ocean voyage. Where the tractor is to be out of operation for any period of time—let's say three weeks or longer—there are some very important precautions to be observed.

If it's possible, the engine should be run for a few minutes each week, for the reasons mentioned previously in

referring to the starting engine. Sometimes this cannot be done, in which case the injection valves should be removed once a month and $\frac{1}{2}$ of a pint of lube oil poured into each cylinder. Then, with the compression lever at "Start" and the throttle at "Stop", the engine should be cranked a few times. The cranking procedure should be repeated once a week.

Similar care should be given the starting engine, although $\frac{1}{2}$ pint of lube oil in the spark plug hole should be sufficient.

If you are able to start the tractor, run it backward and forward a few times. This will keep seals from freezing to shafts and breaking in operation later.

Again, don't forget to remember the radiator. Perhaps the tractor does start out in the mild California climate; by the time its journey is ended it may be in a sub-zero temperature. Unless it is to be run, it is a worthwhile precaution to drain the cooling system and guard against the possibility of a burst radiator or cracked block. If it is going to be run, pour in anti-freeze.

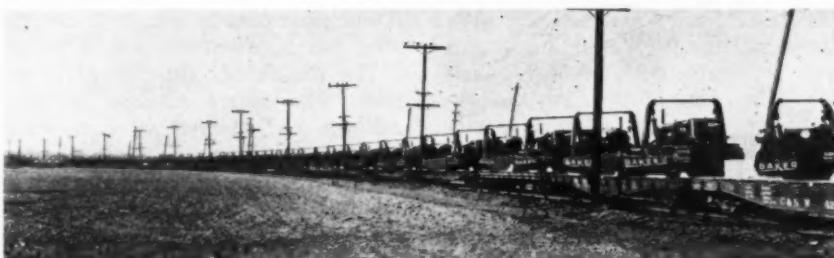
To Victory

We pointed out at the beginning of these articles that the maintenance and operation steps outlined will actually save time through fewer machine shut-downs for repairs. But even if they meant the expenditure of 30 minutes or an hour a day they would be well worth while, for every machine which is running on borrowed time represents a big contribution toward victory.

The Tanks of Peace Go Forth to War

Before a cantonment, navy yard, munitions plant or flying field can be built, the unromantic bulldozer, sometimes called "the tank of peace," must do its prosaic but essential jobs of ground breaking, leveling and grading. Bulldozers are today playing an

important part in America's war effort. Here is a trainload of 60 bulldozers for an undisclosed destination, part of a consignment of 281 units built by Baker Manufacturing Co., Springfield, Ill., for the Bureau of Yards and Docks of the U. S. Navy.



Trainload of 60 Bulldozers for U. S. Bureau of Yards and Docks

Save Manpower for Warpower!

The above title is the theme of the 31st National Safety Congress and Exposition, to be held in Chicago, October 27-29, the National Safety Council announced Sept. 1. This first wartime Congress since 1918 will be devoted completely to the safety job now at hand—to help win the war.

The entire Congress program, covering every phase of safety with 175 sessions and 500 program participants, will be centered on the problem of stopping accidents that delay victory by slowing production, impeding the movement of troops and supplies, and wasting manpower, material and time.

The 1942 Congress comes in the midst of a nationwide war emergency safety campaign being conducted by the Council at the direct request of President Roosevelt. To provide the Council with sufficient funds to carry on the greatly expanded program urged by the President, industrial and business leaders of the nation have formed the War Production Fund to Conserve Manpower, under the chairmanship of William A. Irvin, former president of U. S. Steel. The War Production Fund is seeking to obtain from industry and commerce the \$5,000,000 needed to do the wartime safety job.

"We regard the 1942 Congress as the most important ever held," said Ned H. Dearborn, executive vice-president of the Council. "It will give safety leaders the country over their first opportunity since the war began to meet for a mass attack on accidents that are delaying victory."

"Safety has a wartime assignment that is just as specific as building tanks or producing food for the army. Our job is to stop accidents and save manpower. Right now, every accident casualty is a war casualty."

Headquarters for the Congress will be the Hotel Sherman in Chicago, but sessions also will be held in the Morrison and LaSalle hotels. An exhibit of all types of safety appliances and equipment will be a feature.

Priorities Increase Use of Timber in New Jersey

The New Jersey State Highway Department recently announced that priorities on bridge and road construction materials have forced revision of completed plans, and make necessary virtually new designs embodying the use of timber as a substitute for steel in bridge construction. The thickness of concrete has been increased in roads where metal reinforcement cannot be obtained.



Official U. S. Navy Photograph

"Seabees" Build a Naval Base in the South Pacific. Tents hidden from the sight of enemy planes by towering coconut palms flank a new street in a Southwest Pacific base. The "Seabees" lay down steel mats which later are filled with coral rock to make a smooth surface

THE SEABEES

Our Navy's Organization of Construction

Specialists for World Wide Service

SHOVEL operators, bulldozer men and other kinds of dirt moving equipment operators can be enlisted as first class petty officers in the "Seabees", fast-working men of the U. S. Navy's construction regiments, now located at advance and mobile bases at many points outside the continental limits of the United States.

Men enlisted in the "Seabees" are going to build advance fleet and air bases; and as the primary consideration is runways and taxiways, the enlistment of men who are qualified in this field is desired by the Bureau of Yards and Docks. As we are at war, all such construction will have to be done at high speed, and the qualifications of the men must be of the superior order necessary to insure it. Another consideration in the construction of fleet bases is the building of roads, and here again the Navy desires the best of personnel.

Petty officers of the class here mentioned begin for the most part with a base pay rate of \$114.00 and allowances which will eventually make a total of approximately \$170.00 per month.

This new branch of the Naval service is fast expanding and will continue so for months to come. Its beginning was made in October, 1941, when one company of 99 men—skilled mechanics in more than a dozen different lines—were banded together to build the bases so essential for successful prosecution of the war. Two months later five additional com-

panies were formed, designated primarily for utilization as administrative units by Officer-in-Charge of construction work where it was being done by contractors with civilian labor. Their usefulness was soon manifest.

Last December, one construction regiment of approximately 3300 officers and men was authorized, and recruiting was under way in January, 1942. All applications for enlistment were first approved with regard to the technical qualifications of the applicant at one of the five recruiting districts. Professional qualifications corresponded to the trade of the individual applicants. The first battalion of the first regiment started its training on January 26, 1942. One group was sent to the Naval Air Station at Quonset Point, R. I.

The final selection of men for this battalion included a great variety of specialists such as firemen, electricians, drillers, riggers, welders, telephone men, truck drivers, pipefitters, painters, road machine operators, steel workers, draftsmen and laborers. These qualified men were enrolled in Class V-6 of the Naval Reserve with ratings ranging from Seaman, second class, to Chief Petty Officer. They were given normal base pay, allowances and chances for promotion. The same regulations and opportunities exist today.

The "Seabees" in "paving the way" for Uncle Sam's sailors and marines, constitute one of the most important and necessary branches of the U. S.

Navy. They occupy and build fortifications in territories which, but for them, might already become easy enemy stepping stones to the shores of America. Also, they are trained for engagement in action with the enemy when the occasion arises. In sum total, they are a closely knit body under command of officers of the Civil Engineer Corps, carrying out effectively all phases of construction work in potential combat zones, and after military training, are prepared effectively to resist enemy interference with their assigned task.

From recruiting centers men enlisted in this service are sent to naval training stations throughout the country where they are thoroughly trained before being assigned to distant bases. At Norfolk, Va., a training station is now being erected to accommodate 10,000 men. Organized along military lines, companies of "Seabees" form regiments of three battalions, each battalion comprising four construction companies of 226 men each and one headquarters company of 165 men, composed mainly of specialists such as clerks, bakers, cooks, pharmacists, etc. It is claimed they can fix anything, even a watch.

The mission of these construction units was clearly outlined by Rear Admiral Ben Moreell, when he commented that "this is a real opportunity for those two-fisted, red-blooded Americans who are not fighting behind a gun to serve shoulder to shoulder with the combatant forces of the Naval Service."

Tests of Furfural as an Anti-Stripping Agent

Results indicate that a precoat of furfural prevents stripping of asphalt from hydrophilic aggregates, but that proper grading and good curing are also essential in seal coat construction

URING the years 1939 and 1940 an investigation was conducted in the Materials Testing Laboratory of the College of Engineering and the Bureau of Highways at Moscow on the stripping of aggregate used as seal coat material. A report of this investigation has been issued by the Bureau and College of Engineering as Report No. 3 A¹, under date of August, 1940.

In the course of the investigation the use of furfural was suggested as a possible remedy for the stripping indicated. Furfural, C_4H_8O-CHO , is a by-product of the manufacture of breakfast oats, gaining considerable prominence as a selective solvent for refining crude rosin and lubricating oils. Condensations of furfural with either phenolic or non-phenolic materials result in the production of various kinds of resins. Other uses include its application as a preservative, fungicide, dye solvent, wetting agent, weed killer, demulsifying agent, and as a solvent and plasticizer in the manufacture of abrasives.² Recent investigations, such as the one made by Dr. H. F. Winterkorn, University of Missouri and Missouri State Highway Department, have indicated that furfural may have a use in improving the affinity between certain aggregates and bituminous materials.³ Liquid furfural is amber in color with a specific gravity at 20°C of 1.16 and a boiling point of 160°C.

Purpose of Investigation

Previous Work.—The investigation of stripping mentioned above was limited to one aggregate and a bituminous material from a single source. The advantages of the aggregate used, a glacial pea gravel from the vicinity of Spokane, will be recalled from the standpoint of appearance and safety; it is much lighter in color than basalt

By ALLEN S. JANSEN
Testing Engineer, Bureau of Highways
Idaho Department of Public Works, Boise, Idaho

We give here the complete text of Mr. Janssen's report on laboratory and field tests made by the Idaho Bureau of Highways and College of Engineering Materials Testing Laboratory on their Project Number 4A. The purpose of the investigation was to determine the effectiveness of furfural in improving the bond between asphalt and certain aggregates used in seal coating operations — aggregates wholly desirable except in this one matter of bond. Laboratory tests indicated that a priming with furfural is almost one hundred percent effective in preventing stripping when applied to dry aggregate, but that with moist aggregate and adverse curing conditions such as prevailed on the field tests of this project, it will not prevent the mechanical stripping of the seal coat from its base. These conditions apparently were the sole cause of the unsatisfactory result reported on the field test, and it is to be hoped that other tests will be made, either in Idaho or elsewhere, under more nearly normal conditions.

THE EDITOR

and is, therefore, easier and safer for night traffic use. The rounded particles may also improve riding conditions without reducing the non-skid value of the surface. Tests of several kinds, however, had revealed that this aggregate was much less resistant to stripping than the local basalts used as seal coat aggregates. The bituminous material used was from a Montana source, since a majority of the recent field projects in this part of the state have been constructed with it.

Using furfural as a primer, some preliminary experiments were run to learn more about its effectiveness with the particular aggregate and bituminous material being studied. The equivalent of 0.2 gallon per square yard of SC-6 asphaltic material and 25 pounds of seal coat aggregate per square yard was used in making the experimental specimens. The aggregate was applied at room temperature and a curing period of 24 hours, also at room temperature, allowed prior to stripping tests.

Aggregate was applied in several different ways, in a dry condition without precoating, with a precoating of approximately 0.28% by weight of furfural added previously but allowed to dry, and with an incomplete precoating obtained from furfural fumes. A wash-type stripping test as described in Report No. 3 A was employed, wherein two samples of 60 to 80 rocks were picked out of the asphalt, placed in flasks containing distilled water, which were in turn fastened to the standards of a Ro-tap machine and agitated for 25 minutes. The amount of stripping was reported as an average of the number of rocks completely stripped after the agitation period. Test results are shown in Table I and indicate that complete precoating with furfural reduces the stripping tendency to a marked degree.

Additional tests, using MC-5 asphaltic material from the same source, indicated similar results. Application of the furfural to wet aggregate proved less effective; increase in



Fig. 1.—View of completed section

¹ *Stripping of Aggregate Used as Seal Coat Material*, Report No. 3A, Materials Testing Laboratory, Bureau of Highways and College of Engineering, Moscow, Idaho.

² *Technical Bulletin No. 52*, Technical Division, the Quaker Oats Company, Chicago, Ill.

³ Hans F. Winterkorn, *Affinity of Hydrophilic Aggregate for Asphaltic Bitumen*, INDUSTRIAL AND ENGINEERING CHEMISTRY, Vol. 30, December, 1938.



Fig. 2.—View of section, January, 1941



Fig. 3.—View of section, January, 1941

TABLE I

Stripping Results for Specimens with 0.2 Gallon SC-6 per Square Yard,
Aggregate Unheated, Cured at Room Temperature, 70°F.

Asphaltic Material	Aggregate	Aggregate Moisture Condition	Primer	% Stripping 24 hr. Cure at 70°F.	Remarks
SC-6	Gravel	Wet	None	51	
SC-6	Gravel	Dry	None	44	
SC-6	Gravel	Dry	Furfural	33	Fumes used enveloping aggregate
			Vapor		0.28% with complete coverage
SC-6	Gravel	Dry	Furfural	0	

the time between the furfural application and the aggregate application also indicated less effectiveness.

Present Work.—The use of furfural to precoat the seal coat aggregate

seemed to hold enough possibilities to merit its use, and a field experiment was, therefore, inaugurated. Project FAP 18 A(3), 82 A(4), and 82 B(2), consisting of the construction of a



Fig. 4.—Appearance of mat prior to seal coat construction



Fig. 5.—Spreading seal coat aggregate with Buckeye Spreader



Fig. 6.—Mat appearance immediately after application of bituminous material

bituminous mat and seal coat on approximately eight miles of the North and South Highway near Moscow, had been placed under construction in the early summer of 1940 and was scheduled for completion during the latter part of August. A full width section on this project, approximately 500 feet long, was chosen as an experimental section upon which seal coat aggregate precoated with furfural would be placed. The section chosen was located on a relatively flat grade



Fig. 7.—Appearance of finished surface after rolling



Fig. 8.—Distributor applying bituminous material



Fig. 9.—Appearance of surface immediately after aggregate application

where water runoff and tractive forces due to accelerating traffic would be a minimum.

In addition to the construction of this field project and subsequent observations of its behavior, a supplemental laboratory investigation was commenced.

From the field and laboratory study it was hoped that the effect of furfural in improving the affinity of a

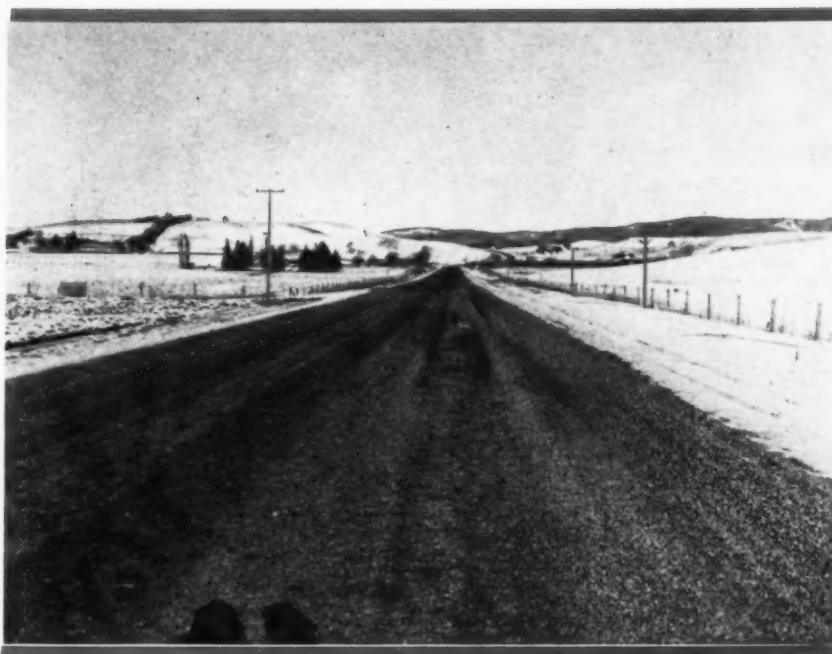


Fig. 10.—Closeup of section, January, 1941



Fig. 11.—View of project near Moscow, January, 1941

particular hydrophilic aggregate for a given asphaltic material might be evaluated.

Experimental Field Section

General.—Work on Project FAP 18 A(3), 82 A(4), and 82 B(2) was slowed down considerably through difficulties encountered by the contractor in the production of crushed rock for the bituminous mat. Numerous early fall rains helped to delay construction and the mat under the experimental section, using an MC-2 asphaltic material, was not constructed until Octo-

ber 1, 1940. The use of SC-6 asphaltic material had been specified originally for the seal coat, but due to the construction delay a change was made to MC-4 material furnished by the Standard Oil Company of California.

Appreciating the fact that the seal coat was to be constructed under extremely adverse conditions and that experiments had revealed less effectiveness for furfural with lighter oils, it was decided to construct the experimental section regardless of these conditions. By October 15, the contractor was ready to commence the

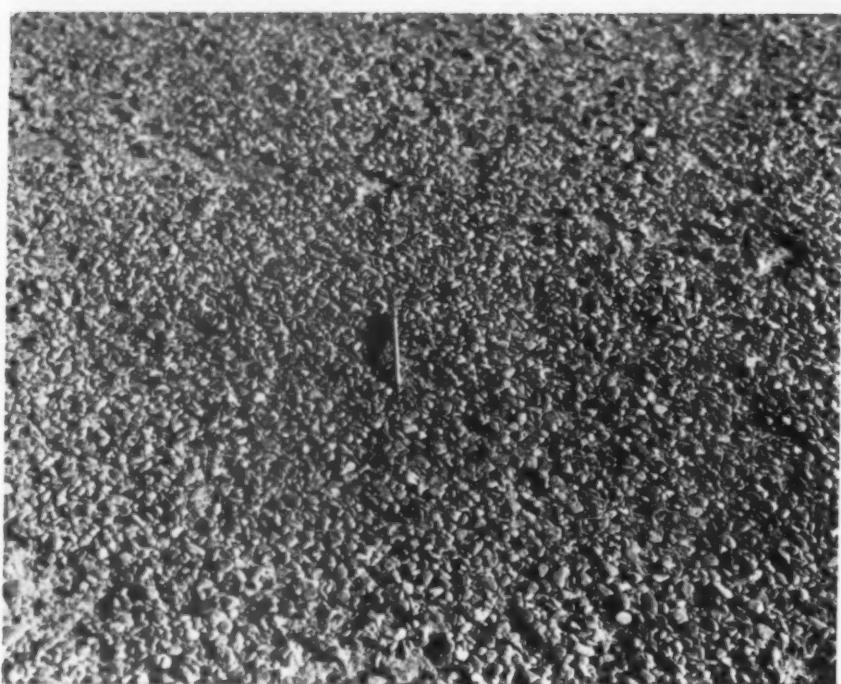


Fig. 12.—View of surface on section, January, 1941



Fig. 13.—View of surface on section, January, 1941

construction of the seal coat and on October 19, the experimental section was reached and constructed.

Construction.—The relatively new bituminous mat was extremely porous and it had been found expedient to apply approximately 0.1 gallon per square yard of the seal coat asphaltic material a day previous to the construction of the seal coat proper. The appearance of the mat after this application and just prior to the seal coat construction is shown in Figure

4. Construction then commenced with the application of 0.3 gallon per square yard of asphaltic material. Figure 6 reveals the appearance of the surface after this application. In Figure 8 the distributor is shown making the application at another section, on part of which, as indicated in the foreground, aggregate had already been placed.

The seal coat aggregate, complying with Idaho Specifications for Type A seal coat material and with the repre-

sentative grading shown in Table II, was then placed as quickly as possible. It was loaded into the trucks from railroad cars located on a siding in Moscow by means of a Barber-Greene loader as shown in Figure 15.

Aggregate for the experimental section was precoated with furfural at this point. A small 5-gallon capacity

TABLE II

Representative Mechanical Analysis
of Seal Coat Aggregate
Total Sample, Percent Passing

Size	Percent Passing
$\frac{5}{8}$ in. sq.	100
$\frac{1}{2}$ in. sq.	85
$\frac{1}{4}$ in. sq.	7
No. 6	1
No. 200	Trace

hand spray, with pressure maintained by contact with the city water system, was obtained for this purpose. Delivery of aggregate to the truck by the loader was slowed down consistent with the time estimated necessary to coat the aggregate thoroughly with the spray at the point of delivery in the truck. Approximately 15 minutes was taken to spray the aggregate required to fill one truck, approximately 0.38% of furfural by weight of aggregate being used. Complete coverage was impossible to obtain, largely because the aggregate was in a wet state containing about 2% of moisture by weight. Experiments had revealed reduced effectiveness for furfural in such a case, but under the conditions it was impossible to dry the aggregate.

The precoated aggregate was immediately transported to the experimental section, a distance of approximately a mile and a half, and almost immediately applied. The section length was constructed in three widths of approximately nine feet each. The material was spread within two minutes after the asphaltic application with a Buckeye spreader as shown in Figure 5, each of the three trucks used covering a strip with an application of about 28 pounds of aggregate per square yard. The average elapsed time between the precoating operation and the application of the aggregate to the asphaltic material was probably about 30 minutes. The appearance of the surface after the aggregate application is clearly shown in Figure 9; it is noted that the rock was still wet due to the presence of both moisture and furfural.

The section was then rolled and completed. The appearance after rolling and after traffic had been allowed to use it at reduced speeds is shown in Figure 7. In Figure 1 a view of the completed section is shown. Another

view is shown in Figure 16; boundaries are discernible in the transverse line in the near foreground and the figure in the center of the highway in the distance.

Observations.—Weather conditions prevailing at the time the construction took place did not appear to enhance the chances for a successful seal coat on the project. In the months of September and October more than the usual amount of precipitation had occurred and while the day during which the experimental section was constructed was fairly warm, there were no days as warm as this until the following spring. The nights were very cool and the days were, for the most part, overcast. An unusual amount of moisture fell; an inspection of the weather record, Table A, Appendix, reveals that some rain or snow fell on 19 of the 23 days immediately following the date of construction. This table reveals the severity of the weather all during the month after construction.

With no opportunity to cure properly, and at best held only slightly and insecurely in the asphaltic material, the aggregate became loosened by traffic. Regardless of its nature, it is believed no aggregate would have remained in place under these conditions. Certainly stripping due to the type of aggregate was of minor and secondary importance here compared to the loss of rock torn out by traffic. A different story would have been the case had this project been constructed during hot weather and allowed to benefit from the advantages of an ample curing period before being subjected to the rain and cold weather of the late fall.

There was some indication of difficulty on the experimental section during the first week after construction. At the end of the second week it was much more pronounced but during all this time the appearance was far better than the sections adjacent to it. From the hill south of the section, somewhat less than a mile away, it was easily distinguishable when dry through the light color of the aggregate in place.

At the end of the first month large streaks of aggregate were missing throughout the length of the entire project. No such streaks appeared on the experimental section; the loss of aggregate seemed to be distributed uniformly over the area.

During the open winter that followed, much of the remaining rock was lost. On January 10, 1941 an inspection of the project was made and a number of photographs were taken

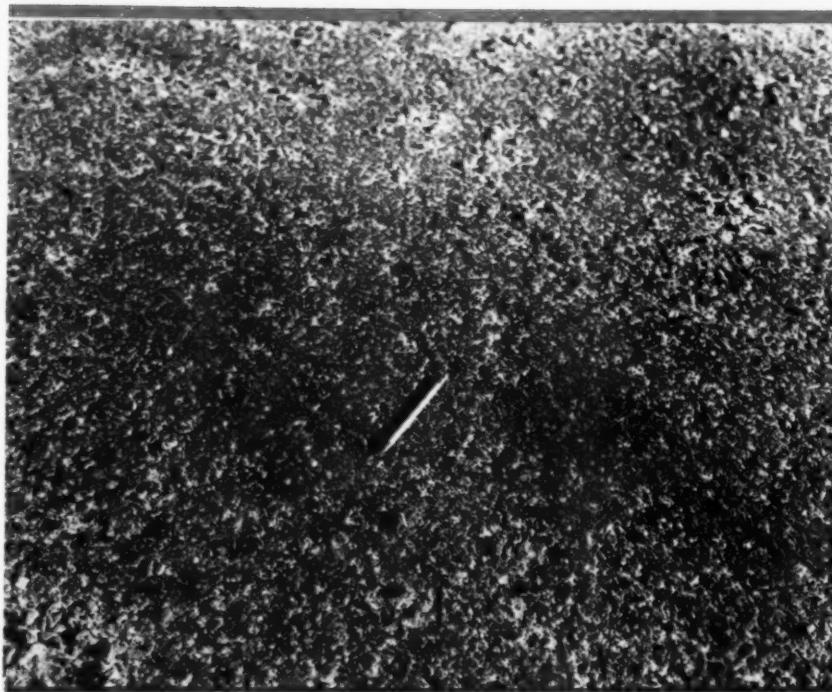


Fig. 14.—View of surface on project adjacent to experimental section, January, 1941

to record the appearance at that time. Figure 2 is a view of the section taken from the same location as Figure 16; the transverse line clearly marks the start of the section, and it extends from this point to the car in the background. Figure 3 is a similar view. In both, the section stands out and its appearance was somewhat better than adjacent sections and sections on other parts of the project. By this time several longitudinal streaks had appeared in the most heavily traveled portions. Figure 10, taken at the very end of the project, affords a closer view of the section. In the distance, at the other end, it is seen that the adjacent section is in worse condition. Comparison of the surface adjacent to it in the foreground of Figure 3 reveals similar conditions.

Another part of the project nearer Moscow is shown in Figure 11. The condition of the surface here was very bad.

Figures 12 and 13 are views of the surface of the experimental section. Patches where rock is missing are visible in Figure 13; the remaining rock for the most part was only slightly fixed in the asphaltic material. Rocks dislodged by force were removed with oil adhering to them. For comparison, Figure 14 shows how the surface appeared on an adjacent section. In this case almost all of the aggregate has been torn off.

With the advent of spring and warmer weather the remaining aggregate on the project has, for the most



Fig. 15.—Loading aggregate with Barber-Greene Loader



Fig. 16.—View of completed section

part, sunk into the asphaltic material, and becoming more fixed there has been little loss.

Laboratory Investigation

General.—While the experimental section in the field was being constructed and observed, a brief laboratory investigation was made. The procedure and methods of test employed followed closely those used in the previous study of the stripping of similar aggregate, Report No. 3 A. In this study, however, both aggregate and asphaltic material used in the tests were obtained from the field project. Amounts of oil equivalent to 0.2 and to 0.4 gallon per square yard were used. Tests were duplicated for dry

and wet conditions of the aggregate, for aggregate treated and untreated with furfural, and also for aggregate temperatures of 70°F (room temperature), 100°F and 225°F. In general, curing periods maintained were a 24-hour cure and a one-week cure at room temperature. After the one-week cure, samples were subjected to three cycles of freezing and thawing before duplicating stripping tests.

Procedure.—As previously stated, aggregate secured from the project and conforming with the grading shown in Table I and asphaltic ma-

terial also secured from the project, an MC-4 material from the Standard Oil Company, were used in all tests.

The methods of making, curing, and testing specimens were similar to those described in Report No. 3 A. When making the specimens, the oil was first heated to 180°F and an amount of either 0.083 or 0.165 pound, corresponding to 0.2 and 0.4 gallon per square yard, respectively, was then weighed out in the 8-inch by 8-inch by 1 1/4 inch galvanized sheet iron pan which had been warmed over the hot-plate previously and placed on the scales. A reasonable attempt was made to keep the pan warm while the asphaltic material was being spread evenly over the bottom. The aggregate in proper quantity and grading and in proper treated, moisture and temperature condition was then added. In the case of the elevated temperatures the aggregate was allowed to remain in the oven sufficiently long to attain the correct temperature; for the wet state the aggregate was kept wet for a time previous to application to approximate field conditions. For the treated samples about 0.3% of furfural by weight was used; this amount is slightly less than that used on the field section, but it was ample to coat the rock thoroughly under laboratory conditions. In every case the aggregate was sprinkled on the asphaltic coated pan bottom by hand and tamped lightly and evenly with folded paper toweling.

When the specimens had been made, they were first subjected to a curing period of 24 hours at room temperature before running any tests. They were allowed to cure further until one week had elapsed, at which time tests were again run. When the second stripping test samples had been removed, the test specimen was barely covered with water and frozen either in a refrigerator or outside. Three complete cycles of freezing and thawing were allowed, after which stripping test samples were selected and subjected to test as before.

After the curing periods two samples of from 60 to 80 rocks each were picked out of the asphalt. Only rocks with asphalt on them were selected and these were not selected at random but instead a whole square, approximately 2 inches on a side, was removed. These rocks, constituting the stripping test samples, were immediately dropped into pint milk bottles, each containing about 200 milliliters of distilled water. The bottles were then placed in the Ro-tap machine, fastened securely and agitated for 25 minutes. After this period

TABLE III

COMPARISON OF STRIPPING TEST RESULTS
FOR SPECIMENS WITH 0.2 AND 0.4 GALLONS
ASPHALTIC MATERIAL PER SQUARE YARD

Variables		0.2 gal. per sq. yd.			0.4 gal. per sq. yd.		
		% Stripping	After	After	% Stripping	After	After
		Cure	Freeze	Freeze	Cure	Freeze	Freeze
Untreated	70°F	24 hr	8		Trace	0	0
	70°F	1 wk	Trace	Trace	0	0	0
	Dry	24 hr	2		Trace	0	0
	Dry	1 wk	0	0	0	0	0
	100°F	24 hr	6		5	0	0
	100°F	1 wk	Trace	Trace	0	0	0
Treated	225°F	24 hr	6		0	0	0
	225°F	1 wk	Trace	2	Trace	0	0
	70°F	24 hr	2		0	0	0
	70°F	1 wk	0	0	0	0	0
	Dry	24 hr	0		0	0	0
	Dry	1 wk	0	0	0	0	0
Treated	100°F	24 hr	Trace		0	0	0
	100°F	1 wk	0	0	0	0	0
	225°F	24 hr	Trace		0	0	0
	225°F	1 wk	0	0	0	0	0

TABLE IV

COMPARISON OF STRIPPING TEST RESULTS
FOR SPECIMENS WITH CURING PERIODS
OF 24-HOURS AND ONE WEEK

Variables		24-hour Cure			1-week Cure		
		% Stripping	After	After	% Stripping	After	After
		Cure	Freeze	Freeze	Cure	Freeze	Freeze
Untreated	70°F	.2g	8		Trace	Trace	Trace
	70°F	.4g	Trace		0	0	0
	Dry	.2g	2		0	0	0
	Dry	.4g	Trace		0	0	0
	100°F	.2g	6		Trace	Trace	Trace
	100°F	.4g	6		0	0	0
Treated	225°F	.2g	8		Trace	2	Trace
	225°F	.4g	0		0	0	0
	70°F	.2g	2		0	0	0
	70°F	.4g	0		0	0	0
	Dry	.2g	0		0	0	0
	Dry	.4g	0		0	0	0
Treated	100°F	.2g	Trace		0	0	0
	100°F	.4g	0		0	0	0
	225°F	.2g	Trace		0	0	0
	225°F	.4g	0		0	0	0

the rocks were transferred from the bottles to a porcelain dish and covered with clear tap water. The amount of stripping was observed and reported as a percentage determined by dividing the number of rocks completely stripped by the total number of rocks in the sample.

Test Results.—In Tables III to VI, inclusive, comparisons of stripping test results are shown; the same data have been used in each case but the variables have been separated for ease of comparison. Percentages are averages for a set of two tests.

The comparison of results shown in Table III reveals the effectiveness again of an increased amount of asphalt; this observation was made in the previous study on stripping and particularly for MC material. For both the treated and untreated specimens this decrease was evident. In this tabular comparison, as well as in all the others, it is noted that the treated specimens suffered less stripping than did the untreated.

In Table IV the effect of the longer cure of one week is to reduce stripping tendencies. While the relative decrease is larger for untreated specimens the treated specimens in every case revealed no stripping at the end of the week cure.

Upon comparing the values in Table V it is observed that there is a tendency for stripping to increase when the aggregate is heated slightly to 100°F. This tendency is most noticeable at the end of the 24-hour cure and with the 0.2 gallon per square yard application. The tendency is very slight for the treated sample. Except in one instance the same tendency exists when the aggregate is heated to 225°F. In the previous study the MC specimens did not behave in this manner although the RC specimens did. This action cannot be explained readily, although the grade and source of MC material in the two studies were different.

From Table VI it is observed that there is a general increase in stripping for the wet aggregate, especially for the untreated aggregate. No stripping was evident for the treated aggregate, wet or dry. These observations for the untreated specimens corroborate previous results.

Conclusions

Through the medium of the field experimental section, particularly, it is believed several conclusions may be drawn as a result of this investigation. While weather conditions and the time of construction were extremely unfavorable, they served to accelerate relative performances. It should be

emphasized that obvious problems of economy and methods of application were not objects of study. The primary purpose at all times was to learn whether precoating treatment was effective, under the conditions prevailing, in improving the affinity of an aggregate, known to have hydrophilic characteristics for an asphaltic material in order that the aggregate might be used satisfactorily and thus take advantage of its other desirable characteristics.

There will always be some question as to whether the performance observed in this field project is truly relative to the performance that

might have been observed had normal and more usual conditions attended the construction. That there was an acceleration of performances and that this served to emphasize the difference in performances of the treated and untreated sections is not doubted. The far greater importance of mechanical stripping here serves to confuse and defeat the purpose of the experiment. Almost at once it can be concluded that, under the conditions prevailing, the furfural treatment is not satisfactorily effective. Had normal conditions prevailed the reverse might well have been true. At least tendencies might have been evaluated

Variables		70°F Aggregate			100°F Aggregate			225°F Aggregate		
		% Stripping	After		% Stripping	After		% Stripping	After	
			Cure	After		Cure	After		Cure	After
Untreated	.2g	Wet	24hr	8						
		1wk	Trace	Trace	Trace					
		24hr	2			6		6		
		1wk	0	0	0	Trace	Trace	Trace	2	Trace
		Wet	24hr	Trace						
	.4g	1wk	0	0	0					
		Dry	24hr	Trace		6		0		
		1wk	0	0	0	0	0	0	0	0
		Wet	24hr	2						
		1wk	0	0	0					
Treated	.2g	Dry	24hr	Trace						
		1wk	0	0	0	Trace	Trace	Trace	0	0
		Wet	24hr	2						
		1wk	0	0	0					
		24hr	0							
	.4g	Dry	24hr	0						
		1wk	0	0	0					
		Wet	24hr	0						
		1wk	0	0	0					
		24hr	0			0		0		

Variables		Wet Aggregate			Dry Aggregate		
		% Stripping	After		% Stripping	After	
			Cure	After		Cure	After
Untreated	.2g	70°F	24 hr	.2g	8	2	
		1 wk	.4g	Trace	Trace	Trace	
		24 hr	.2g	0	0	0	
		1 wk	.4g	0	0	0	
		24 hr	.2g	0	0	0	
	.4g	225°F	1 wk	.2g	0	0	
		24 hr	.2g	0	0	0	
		1 wk	.4g	0	0	0	
		24 hr	.2g	0	0	0	
		1 wk	.4g	0	0	0	
Treated	.2g	70°F	24 hr	.2g	2	2	Trace
		1 wk	.4g	0	0	0	0
		24 hr	.2g	0	0	0	0
		1 wk	.4g	0	0	0	0
		24 hr	.2g	0	0	0	0
	.4g	100°F	24 hr	.2g	0	0	0
		1 wk	.4g	0	0	0	0
		24 hr	.2g	0	0	0	0
		1 wk	.4g	0	0	0	0
		24 hr	.2g	0	0	0	0

in terms of their proper relation to what is meant by the word effective.

Certainly it may be concluded that the furfural treatment was effective in reducing the tendency of this aggregate to strip, due to its hydrophilic nature, as measured by the relatively greater amount of aggregate remaining at all times on the treated section. The parallel laboratory investigation using the same materials as were used on the project also served to indicate the effectiveness of the furfural treatment. For the wet aggregate and early cure, the case most nearly like that in the field, conditions were the most favorable for stripping as revealed in the tests; for the treated aggregate, this condition is still the most favorable but the degree of stripping is greatly reduced. All results and tendencies observed in the previous stripping investigation seemed to be corroborated in the performance of this later set of specimens.

Unless mechanical stripping is of secondary importance, it is not believed that any treatment such as the furfural treatment, designed as it is to improve the affinity of an hydrophilic aggregate, is justified. Even with a heavier oil, a larger amount of it applied and a good cure, it is doubtful whether the aggregate in use with its present grading could be used in a seal coat wherein mechanical stripping would be a minor problem. With particles largely of one size and extremely hard, this aggregate is not resilient enough to absorb the energy loads transmitted to it by fast moving traffic and, therefore, tends to

tear itself loose from the asphaltic cementing medium.

With more of a variation in size, it is believed this condition would be alleviated for this particular aggregate. A more resilient and less hard aggregate which would break down to some extent in absorbing energy rather than transmitting most of it to the asphalt might also be successful in meeting this problem.

Under such conditions, treatment of aggregates with hydrophilic characteristics might well be warranted, especially if heavier oils and ample cures are employed.

Personnel

G. E. Carter, Resident Engineer, was in direct charge of the project under the supervision of James Reid, District Engineer, and C. P. Humphrey, Director of Highways. Roy L. Bair of Spokane, Washington, was the contractor with McAtee and Heath, also of Spokane, in charge of oiling operations. Construction of the experimental section and incidental laboratory experiments were supervised by the Materials Testing Laboratory, University of Idaho, operating as a part of the Materials Division of the Bureau of Highways, under the authority of C. C. Hallvik, Materials Engineer. Furfural for the project was furnished by the Quaker Oats Company from their plant at Cedar Rapids, Iowa.

The cooperation and suggestions of Mr. Roy W. Jump, District Materials Engineer, are gratefully acknowledged.

Mexico Seeks Used Road Machinery for Big Road Building Program

Mexico is looking to the United States for road building machinery to maintain its existing highway system and to build new roads to vital mining areas which are pouring out an ever-growing stream of strategic raw materials for United Nations war production.

War Production Board officials are considering a plan to share road-building equipment with our southern neighbor and ally. Mexico needs tractors, hauling scrapers, automatic shovels, graders, air compressors and rock drills. With improved highway transportation, Mexican mine production is expected to become even more important for hemisphere defense. The survey of second-hand road equipment undertaken by the War Production Board has been encouraging. Considerable road machinery is

expected to be made available after proper repairs are made.

Second-hand road-building equipment also may be used in the construction of the final highway links, recently started, to complete the overland transportation system connecting the Inter-American Highway which passes through Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica and Panama with the Mexican railroad system and the United States.

The new highway will connect with the Mexican standard gauge railways and thus provide a co-ordinated railroad and truck transportation system from the United States to the Panama Canal. These new transportation developments are expected to relieve some of the pressure on inter-American shipping in the Gulf of Mexico and the Caribbean Sea and at the

same time aid in maintaining vital military supply lines between continental United States and the important Panama Canal defense zone.

The new sections of about 625 miles of "all-weather" road, over which thousands of tons of war supplies will eventually move, will be linked with about 925 miles of surfaced highway already built from the Guatemala-Mexico border south to the Panama Canal. The completed highway also will connect with the new 50-mile Trans-Isthmian Highway which is nearing completion and which will parallel the Panama Canal. Construction of the new highway links are already under way.

Rated Capacity of Trucks and Actual Load Carried

Studies by the Highway Planning Survey of Minnesota showed that rated capacity of trucks rarely governed weight of loads carried. Nearly one-third of the loaded trucks weighed at loadometer stations operated by the Planning Survey had loads more than double, a few as much as five times, the rated capacity. The average gross weight and average load carried by single unit trucks of rated capacities ordinarily used were found to be as follows:

Rated Capacity	Average Weight Pounds	Net Load	Gross
One-half ton	900	4,000	
Three-quarter ton	1,000	4,300	
One ton	2,300	6,100	
One and one-half ton... 4,900		10,400	
Two to two and one-half tons	6,200	12,900	
Three to three and one-half tons	7,500	16,500	
Four to four and one-half tons	7,200	17,000	
Five tons	7,300	18,500	

Average gross weight of semi-trailers and truck combinations with one ton truck-tractors was 14,000 lb.; with 1½ ton tractors, 22,400 lb.; 2 to 2½ ton tractors, 25,900 lb.; 3 to 3-1/3 ton tractors, 28,100 lb.; 4 to 4½ ton tractors, 31,600 lb.; five ton tractors, 33,000 lb. It may be noted that the average gross weight of 1½ ton truck tractors with semi-trailers was 3,900 lb. in excess of the average gross weight of five ton single-unit trucks.

Used Equipment to Be Registered

A dispatch from Washington states that on September 1 the War Department Board ordered all owners of used construction equipment to register their equipment within 30 days.

It was estimated there are 500,000 pieces of used equipment in the country, much of it idle.

A Double-Barreled Economy

Early correction of "pumping joints" conserves both pavement and tires

WITH the necessity of having the largest possible part of our production facilities available for direct military requirements, much attention is being directed to the careful inspection and maintenance of our already existing transportation equipment that it may carry the large increase in the volume of traffic with the least possible drain on production facilities and strategic materials. Many operators of trucks and busses have outlined special inspection and preventative maintenance programs. The private passenger car is also receiving much more careful attention.

While possibly not as conspicuous, or at least not receiving as much public attention, many of the problems confronting the highway maintenance engineer are equally as important. The life of the cars and trucks, particularly the tires, is as much dependent upon the condition of the pavement they use as it is on any direct care they may receive. Proper pavement maintenance is just as much preventative maintenance as far as the car or truck is concerned as if the work were being done on them directly.

Preventative maintenance is nothing new with the highway engineer. Much of his program has been laid out with that thought in mind. Now with the increased demands on the highway both as to weight and number of heavy vehicles, along with the restriction in the use of many of the maintenance materials and a reduced or changed personnel, he is giving more careful attention to the thought of early maintenance, or, in other words, the treatment of many of the highway diseases in their early stages.

With the increased volume of heavy traffic due to the defense effort, many of our highways are required to carry traffic much above that anticipated at the time of construction, and because of this are showing some distress due to the action of this traffic as it passes over them.

This distress may show up in different forms, and its character and

By JOHN W. POULTER
Koehring Company
Milwaukee, Wisconsin

In November and December 1940, ROADS AND STREETS carried a long and highly detailed article entitled, "Sub-Grade Treatment by Mud-Jacking and Filling." The author, Mr. Paul J. Kunzer, Junior Highway Engineer, Illinois State Highway Department, had had, at the time of writing, two full seasons of experience on this type of work, and had encountered and overcome a variety of special problems. He opened with a description of the causes and effects of "pumping," and continued with an account of the equipment, materials and methods used to combat the difficulty.

In the present article, Mr. Poulter stresses the early correction of pumping joints, primarily as a measure for conservation of vital war materials; and very aptly points out that the saving is not limited to cement and reinforcing steel and labor, but that it extends to the vehicles using the road — particularly to heavy vehicles, and most particularly (but not exclusively) to tires. He describes the phenomenon clearly, with special attention to the early indications by which it may be recognized, and so cared for with a minimum expenditure of time and money. Though Mr. Poulter's emphasis is on war economy, his suggestions clearly can be applied with profit in times of peace.

degree will vary greatly in different types of pavement. In the case of concrete carrying heavier traffic than was anticipated in the design, or in some pavements carrying a large volume of heavy truck traffic, pumping has developed at many of the transverse joints and cracks. The action of the traffic over the joint or crack, coupled with the action of the water under the slab or in the grade up next to the slab, has caused a shifting, or a washing out, of some of the grade material immediately adjacent the joint or crack.

As a rule, the grade under the receiving end, the end just past the

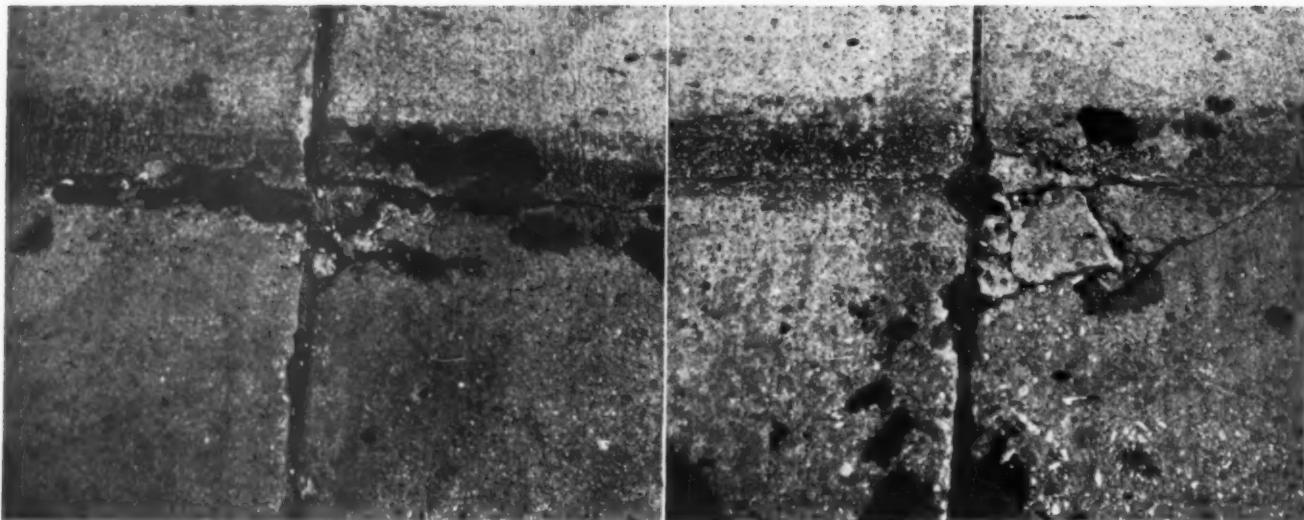
joint or crack, is the only part affected and this may extend as much as two or three feet ahead of the joint. This is responsible for the faulting or offset joint condition often noticed, with the receiving end of the slab always below the end from which traffic has just moved, or always down in the same direction with respect to the direction of traffic.

Investigation seems to indicate that on four lane divided pavements the greatest washing is along the outside edge of the slab, while with pavements where adjacent lanes carry traffic in opposite directions, the greatest erosion is near the intersection of the transverse joint or crack with the center joint. This is explained by the fact that the grade along the center line is affected by traffic in either direction, while along the outer edges it is affected by the traffic in only one direction, or because the grade along the center line with two-lane pavements carrying traffic in both directions carries almost twice as much traffic as that along the outer edges.

The rate at which grade material is moved out or displaced by this pumping action is very slow at first and in some cases may not become serious for several years, but as soon as it develops to where there is appreciable slab movement due to the lack of support, the rate of development is progressively much faster. If allowed to continue, the grade support will be weakened until the slab will break off from 5 to 8 feet past the joint, or inside corner breaks will develop. These new cracks offer new places for pumping to start, and if not cared for, result in a progressive breaking up of the slab.

It has been found that if the rather thin voids produced by the pumping action due to traffic are filled with a suitable material, the action can be greatly reduced and much of the pavement breaking prevented at a very reasonable cost. This is being done in several states.

The mud-jacking equipment used for this work, as well as the mixtures



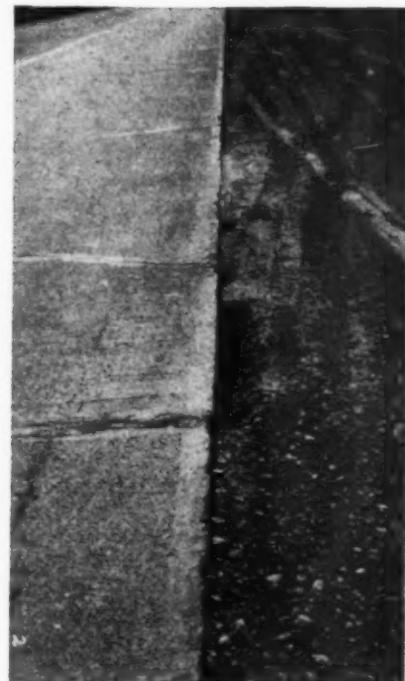
Two stages of the condition at the center line indicating pumping



Example of small openings in the shoulder at the edge of the pavement which are an early indication of pavement pumping

used, vary somewhat in different states, but as they have been discussed in previous articles and re-

ports in this magazine, it would seem more important at this time to point out briefly some of the initial indi-

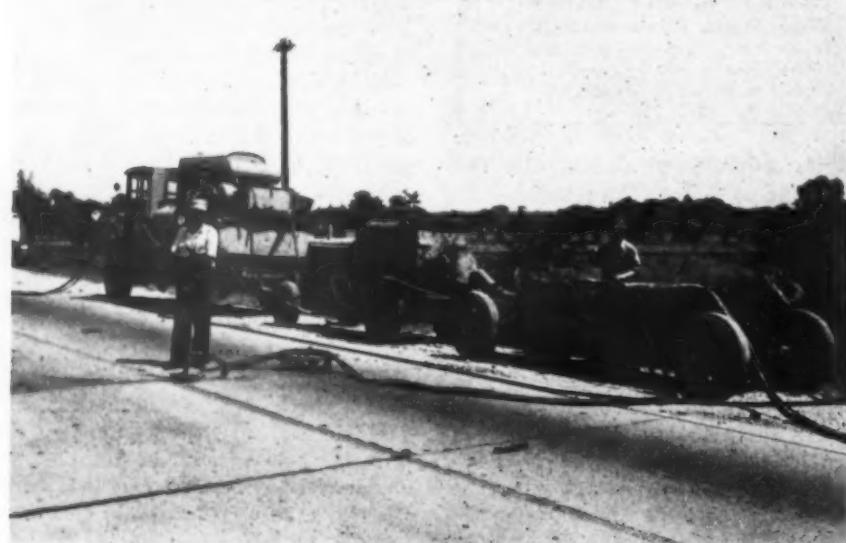


A joint where pumping has developed to a serious stage. [Note that one crack has formed and that pumping has started under the end of the slab just past this crack as indicated by the opening or blowout at the edge]

cations of pumping, which will serve as a guide in correcting this condition in the earlier stages, when only a small amount of material and labor will be required.

Almost everyone is familiar with the characteristic discoloration on the pavement, indicating that some of the grade material has been carried out, but there are other indications in the very early stages which are equally as definite and often show up before there is any appreciable amount of material washed or pumped out.

The great majority of inside corner



A Mud-Jack outfit arranged particularly for treatment of pumping at joints and cracks. (Note the small hose lines and nozzles possible because of the very thin mixture used)

breaks are due to pumping, which is indicated very early, and long before the break occurs, by a spalling of the edges of the slab or the working out of the crack filler material along the center joint for a short distance either way from a transverse joint or crack.

Inspection of the shoulder along the edge of the slab will in almost every case show small openings just past the joint or crack where pumping has started. These small openings are often visible before the joint or crack filling material has become seriously damaged, and long before there is any faulting or difference

in elevation of adjacent ends of adjoining slabs or any discoloration due to grade material on the slab.

Faulting can also be easily noted, even in its earlier stages, when driving along a two-lane pavement carrying traffic in both directions. The joints and cracks in the approaching lane will appear to be more prominent.

If these early indications of pumping are noted, and the condition treated in the early stages, much of our pavement breakage can be prevented, and this work will become a foundation for our whole preventative maintenance program.

Death Takes Two Officers of Universal Atlas Cement Co.

In the month of August, just passed, died two important members of the Universal Atlas organization — Mr. Leonard Wesson, Operating Manager, on the 15th and Mr. Frederick Lee Stone, Vice President, on the 17th.

Leonard Wesson was born in Boston, June 15, 1877, attended grade and high school there, and later studied at Massachusetts Institute of Technology where he was a member of Phi Gamma Delta. He began his business career with his father who owned lead mines in southern Missouri. Entering the cement industry as Assistant Superintendent of the cement division of the former Illinois Steel Co. in 1905, he was later promoted to Superintendent of No. 2 works at South Chicago, and in 1910 became Assistant to the President of its successor organization, the Universal Portland Cement Co. From 1919 to 1930, he was Assistant General Superintendent, Atlas Portland Cement Co. When the Universal and Atlas companies were joined in 1930, he became Assistant Operating Manager, and in 1937 Operating Manager. Mr. Wesson's home was at Scarsdale, N. Y. He is survived by his widow, Louise Allen Wesson, formerly of Syracuse, N. Y., and two sons, First Lieutenant James A. Wesson of the Eighty-third Ordnance Company, and Pvt. Leonard Wesson, Jr., of the 305th Bombardier Group.

Frederick Lee Stone was born in Camden, Arkansas, in 1876. He attended the University of the South, Sewanee, Tennessee, and the United States Naval Academy, and began his business career in 1894 with the New York Telephone Company. Later he was associated with the Massachusetts Mutual Life Insurance Co. at Charlotte, North Carolina. From 1909 to 1911 he was successively Financial

mer Naval Attache at Paris and now commanding a cruiser, Commander John G. M. Stone, now at the Boston Navy Yard, and Caleb Stone of West Orange, N. J.

Asphalt Institute Recommends Specifications to Meet Prevailing Conditions

The Asphalt Institute has just issued a timely publication, Information Series No. 49, "Transportation Shortages Affect Asphalt Pavement Design," in which it shows how redesign of pavement structures may be made without sacrificing the advantages inherent in normal asphalt construction procedure. Included also in this publication are the specifications developed jointly by the Army's Corps of Engineers, Civil Aeronautics Administration and the Public Roads Administration, entitled "Specifications for Constructing Mechanically Stabilized and Prime Coated Sub-Base for Asphalt Pavements or Surface Treatments." Copies of this new number in the Information Series are available without charge upon request to the Asphalt Institute, 801 Second Avenue, New York, N. Y.

New Waterloo Bridge over the Thames at London, Eng., was recently opened for road traffic. It was available for pedestrians on the eve of the war.



Courtesy of The Timken-Detroit Axle Company

The Borrow Pit

¶ Three hard of hearing Air Wardens were going into London one evening and as they passed through the suburb of Wemby one of the Wardens asked, "Is this Wemby?" Another replied "no this is Thursday" and the third piped up "I'm thirsty too, let's stop and get a drink."

• • •

¶ Private F. X. Keashin knows his helmet might come in handy if shrapnel starts raining from the sky but he has a better ultimate use for the tin cap:

"I'm wishing for the day
 'This hat of steel of mine
 'Will be a pot of flowers
 'And latticed with a vine."

—"Chin Strap," the post newspaper,
 Fort George G. Meade, Md.

• • •

¶ Two women were discussing a mutual acquaintance.

First—She has a magnetic personality.
Second—She ought to have. Every stitch she has on is charged.

—Mississippi Highways

• • •

¶ WOMEN GENERALLY SPEAKING (Some Half-Wit Has Found.)

From the *Montana Centerline*.
Lives 75 years.
Marries at 26.
Has a baby weighing 7 lbs. 8 oz.
Quarrels with her husband twice during first year of marriage.
Is 5 ft. 3 in. tall
Weighs 130 lbs.
Goes to the movies 2700 times.
Sleeps 26 years.
Spends 8 years at housework.
Cleans her teeth 28,000 times.
Eats 3 tons of candy, costing about \$2500.
Grows 38 yards of hair.
Spends 6 days hunting her glasses.
Talks for 75 years.

• • •

¶ First Doctor: I had an unusual case today.

Second Doctor: What was it?
First Doctor: I attended a grass widow with hay fever.

• • •

¶ Mother: "Junior, now be a good little boy and say 'Ah-h-h,' so the doctor can get his finger out of your mouth."—*The Yellow Strand*.

¶ When Eugene Field was conducting his newspaper column in Chicago, he made a trip to New York, ran out of funds, looked up a friend and borrowed \$50. Then he promptly forgot about it.

Some months later the friend visited Chicago. He saw Field and asked him for the money. Field promised to do something about it at once.

Next morning, in Field's newspaper column, was this paragraph: "Mr. — of New York is in town, looking after some of his permanent investments."

• • •

¶ The street department put up a detour sign while repairmen were doing a resurfacing job, but motorists didn't pay much attention to the warning.

A foreman solved the problem by erecting a substitute sign which reads: "Good Americans will detour—dam Japs won't."

Everybody is detouring now.

• • •

¶ In northern Africa, two clear streams flow together making a natural river of ink. One stream contains iron compounds from the soil, the other tanin from a swamp. Combined they become black.—*Whitecombings*.

• • •

¶ Tire wear on curves is 1,200% greater than on the straightaway.—*Whitecombings*.

• • •

¶ Fresh fish can be "mined" in the Sahara desert by digging to the subterranean streams.—*Whitecombings*.

• • •

¶ "He who knows not, and knows not that he knows not, is a fool. Shun him.

He who knows not, and knows that he knows not, is simple. Teach him.

He who knows, and knows not that he knows, is asleep. Waken him.

He who knows, and knows that he knows, is wise. Follow him."—*Arabic Saying*.

• • •

¶ The boat had just left Portland when a sprightly little flapper stowaway was discovered in a life boat. The captain ordered her sent to his cabin.

"I don't know what to do with you, I'm sure," he said as he questioned her.

"Say, skipper," she said finally, "how long have you been a sailor?"

¶ *Ticket Dodger*—Our friend on the police force, as we like to say, reports it's a dull day indeed if the constabulary doesn't encounter one of the following specimens of ticket dodgers:

The Brazen Briber—Keeps a \$5 bill wrapped around his driver's license.

The Subtle Briber—Accidentally drops a five-spot on the running board, or suggests that he would like nothing better than to make a contribution to the Policemen's Retirement Fund.

The Damsel in Distress—The tearful, terrified maiden whose mumsy would be just heartbroken if she knew her little baby had run afoul of the law.

The Major Hoople—Hints that he may, ah, speak to the commandant regarding a promotion for such a fine, upstanding officer.

The Big Politico—Suggests that it's a waste of time to write a ticket because it will be torn up at Headquarters anyway, after a word to the Right People.

The Exploited Poor Man—Whines that the cossack police lie in wait for the starving, penniless chap while ignoring the limousines of big shots.

The Exploited Rich Man—Mumbles that the cops stop all the big cars, under the mistaken impression that they can afford a fine, just to turn in a good report.

The Viper-tongued Spinster—Wants to know what the impudent young whippersnapper means by stopping an honest, law-abiding citizen going properly about her business.

The Vampire—Expose a dimpled knee and whispers alluringly in the officer's ear that surely such a big, handsome man wouldn't think of arresting a poor, helpless working girl, now would he?—*From The Postage Stamp*.

• • •

¶ Two women were seated in a crowded street car. One said to her friend: "When I leave you do exactly as I do; don't ask why."

When their stop came she got up and *backed* out and off the car, as did the friend.

After a moment the first woman explained: "I overheard one of those two men standing in front of us say, 'When they leave we'll pinch their seats.'"—*The Yellow Strand*.

What They Laughed at 27 Years Ago

(A PAGE FROM ENGINEERING AND CONTRACTING OF NOVEMBER 10, 1915)

The Lighter Side of Engineering and Contracting

Here Goes the Smokes.

After much deliberation and considerable mind changing, Skinner Mulvey has decided on the prize winner in the September-October story telling contest. The tobacco goes to S. E. R., Richmond, Va., for his contribution "Good Bait Anyway." This was printed in the Nov. 3 issue. The Skinner is pleased to announce that the story telling contests will be continued. For the best story submitted during November and December he will give a \$5 box of cigars or the equivalent value in pipe tobacco. If the winner should be a non-smoker his reward will be a \$5 gold piece. He can present this to his wife or his sweetheart, whichever he chooses. Skinner Mulvey feels under obligations to all who contributed stories and he hopes to hear from them again. He is firmly convinced that "a little wheeze now and then is relished by the wisest men." Won't you, Mr. Reader, help the old gentleman out by sending him your favorite wheezes?

How Expert Accountants Are Made.

SEVERAL years ago when railroad construction was exceedingly active in Arizona there was a notable character known as "Shorty" McBride around the camp who excelled as "champeen" teamster. One evening while the accountants were engaged in rendering their monthly reports, "Shorty," feeling rather jubilant, strolled into the office to jolly the "boys." He inquired of the chief material clerk if he could assist them with their work. The chief retorted by adding, "Why, Shorty, you couldn't keep a set of books in a barber shop." "Shorty," however, insisted he was, also, a "champeen" at figures. "Well," replied the clerk, "see if you can balance this sheet." He handed "Shorty" the monthly report of cars used in construction work and when 12 o'clock came they still found the new expert digging with all his might to get a grand total of the car numbers listed.—C. A. E., Los Angeles, Cal.

Taking No Chances.

SOME years ago Alex McGavock took a contract for building a railroad through a backwoods section of Minnesota where no railroad had ever ventured before. A few days before the road was to be turned over to the owners the contractor made a trial run over it. In pulling out of a small way station the engineer discovered a small country lad on horseback in the middle of the track. The engineer blew the whistle again and again, but the rider only lashed his horse into a gallop and made no effort to turn off into the farm lands on either side of the right of way. At the end of a mile chase the engine was close to the heels of the laboring horse. The pestered engi-

neer leaned out of the cab window and yelled: "You blamed idiot you, why don't you get off the track?" The frightened youth flung back a desperate retort: "Naw sah! Ef ever you git me out yander on that plowed ground you'll ketch me in a minute."

Father Was Called.

A CONTRACTOR had six grown sons. They wouldn't work for the old man because he held out their wages. However, the old sport was clever at poker and on Sundays managed to win all the boys had left of their week's wages. At length the youngest son tired of this arrangement and left home. A couple of months later the old man died. The absent brother was apprised of this event in these words: "God has called father." He wrote back to inquire: "How did God get into the game and what did He hold when He called?"

The Cockroach Wept.

IN the good old days when there were at least two railway jobs under way at the same time, a hobo drifted into a grading camp and landed a job. It was not long before the cook began missing grub from his storehouse. The newcomer was promptly charged with the dastardly deed and the foreman proceeded to interview him. The man denied the charges vigorously. "Why, boss," said he, "I didn't take no food out o' there. There wasn't no grub there. Why, I jes' looked in the door one day an' I met a cockroach comin' outer it with tears in his eyes."

Speaking Politely.

JOHNNIE Block, the butcher for the Bob Russell outfit, on his Virginia job, had bought some fresh meat on the hoof and was trying to drive it back to camp. Johnnie and the cow came to a cross road. The man wanted to go straight ahead but the cow didn't. A negro was coming down the cross road. "Haid her off; haid her off!" yelled Johnnie. The colored man jumped into the middle of the road and waved his arms. The cow kept calmly on. "Haid her off! Haid her off!" yelled Johnnie. "I'se tryin' to, boss," replied the negro. "Speak to her! Speak to her and she'll stop." "Good mawnin' cow, good mawnin'" said the negro politely.

They Guessed Wrong.

JACK Carland had just received a contract for a new railroad grade in southeastern Ohio. Two of his old and favorite employees went over the grade on Sunday before commencement of work. One of these men was Flynn, a powderman, the other was Murphy, the stable boss. The work was nicely staked

out. Murphy put on his glasses and read a stake that was marked C1.7. "Oh yes," he said to Flynn, "Station 17." Flynn stooped over and looked at the stake through his glasses and said "Well, Murphy, you d—d fool. Can't you read a stake? Why that's cut 17 ft." J. F. L., Toledo, O.

Business Was Good.

WHEN Oklahoma and Indian Territories were merged and given statehood the newly created state legislature revised the sizes of several counties—particularly in the western part of Oklahoma Territory. This action eliminated the position of several county boundary lines. Two small towns, only a mile apart in one county, being affected so that they were cast into separate counties, decided to consolidate and move the buildings from one town to the other. The house-moving contractor upon undertaking the job found he would be required to move a graveyard to successfully fulfill his contract. He had finished moving the buildings, when he went to the mayors of the respective burroughs stating, "Fellows, I can't move your graveyard. There's a big sign on the entrance of that cemetery, which says, 'WE ARE HERE TO STAY.'"—C. A. E., Los Angeles, Cal.

Whaddayoumean Humdrum, Herbert?

IT is related that Herbert Spencer threw up a good life-job for the purpose of experimenting with an invention which a fortnight's investigation showed to be utterly impractical. Reviewing this experience 50 years later he said: "Had there not been this seemingly foolish act, I should have passed a humdrum and not very prosperous life as a civil engineer. That which has since been done would never have been done." One fancies that the average engineer will testify to the truth of the "not very prosperous" part of this statement but, humdrum? No, not that, Herbert, not that.

Skinner Mulvey says: I saw a stuffed two-headed calf in a shoe store window the other day. Big crowd blocked the sidewalk. Ain't it great to be celebrated? When you give a sick mule a dose of roach-well salts by blowing 'em down his gullet through a tube, always be careful not to make him cough before the job's ended.





A medium service truck trail Nicolet National Forest

Fire Control and Fire Control Roads in Nicolet National Forest

Part I

THE Nicolet National Forest, comprising 985,765 acres in northern Wisconsin, is an area of diverse activities, having an economic value larger than is imagined by the average traveler, and aesthetic and recreational values which, though not measurable in dollars, are recognized as considerable. All of these values are subject to a high fire risk, and without adequate protection, many of them would be wiped out each year. Conceivably the entire area could be devastated. To the Forest Service of the U. S. Department of Agriculture, falls the duty of preventing such misfortune.

Not all of the land within the limits of the Forest is Government-owned, some 40% belonging to the State, the Counties, or private interests. But such lands, though outside the jurisdiction of the Forest Service, are given exactly the same fire protection as the rest.

Character and Uses of the Forest

By far the greater part of the Nicolet Forest is cut-over timber land, on which second growth pine, fir, cedar, birch, maple and other trees have reached a size affording excellent cover for game,

By LOUIS TAUSCH, JR.

Forest Ranger, Argonne-District
Nicolet National Forest, Wisconsin

and in some cases, actually merchantable timber. Virgin areas remaining in a number of places have a higher value, not only for their timber but also for recreational purposes.

Occupancy and use may be summarized as follows—several small, unincorporated towns, lumber camps, saw mills, many pleasure camps, summer resorts and summer homes, a limited amount of farming, and during the winter a considerable amount of professional fur trapping. Deer hunting is an important use during the short open season. From the

standpoint of National economy, however, nothing is more important than the saving of the irreplaceable growing timber.

The Forest Service sells standing timber where it deems such sale advisable, and supervises its cutting and removal in accordance with Government requirements. The Service is concerned with the administration of the National Forest timber as a natural resource. The aim in the use of such timber may be summarized as follows:

1. To keep the land growing timber. This is a fundamental job of National Forest administration.
2. To remove dangers to new crops and to the surrounding timber.
3. To grow the largest and the best timber crop possible.
4. To get mature or deteriorating timber put into use before it spoils, and to secure the closest practical utilization of trees cut.
5. To obtain a steady and continuous yield of useful wood products from each National Forest unit.
6. To make the disposal of National Forest timber an efficiently run business.



U. S. Forest Service Photo
It is to prevent such scenes as this that fire fighters are organized and fire protection roads built

In addition to the foregoing objectives, there must of necessity, be a close correlation between the handling of timber resource and the handling of other forest resources on a multiple use basis.

Development of natural resources of the National Forest for human use and benefit include such activities as forest fire prevention and suppression, timber stand improvement, reforestation, transportation, planning, construction and maintenance, wild life management, and recreational development. This account will deal only with the functions of fire fighting and road development.

Administrative Subdivision Essentials of Fire Control

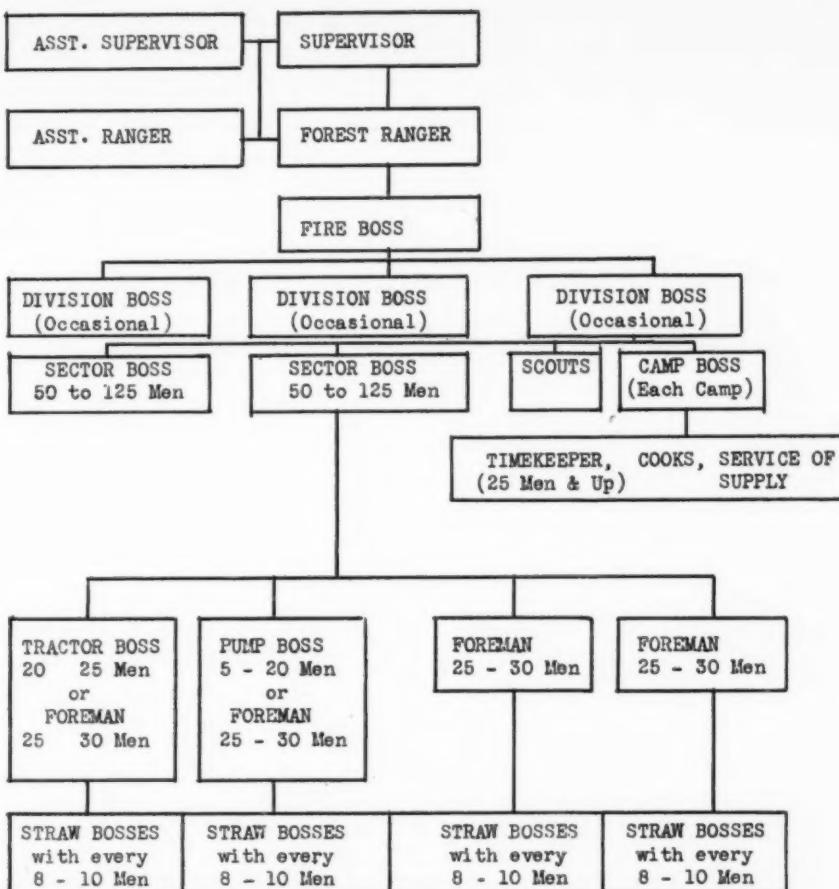
For administrative purposes, including fire protection and all other duties with which the Forest Service is charged, the Nicolet Forest is divided into five districts, each of which is a complete and independent operating unit in charge of a Forest Ranger. These rangers are responsible to the Forest Supervisor, Mr. Galen W. Pike, at Rhinelander, Wisc., for the proper administration of their respective districts. Such decentralization of authority and responsibility makes the district the logical basis for any detailed description of fire control methods, organization, equipment and roads. Conditions, of course, vary somewhat, but the primary problems and the methods of meeting them are the same throughout the forest.

The Argonne District, for which the writer is Ranger, includes 161,646 acres, of which 119,888 acres (or 74%) is U. S. Government-owned, the remaining 26% being in State, County or private ownership.

The main features of fire control are:

1. Public education in fire prevention.
2. Provision of equipment and an elastic organization which can deal with small fires at minimum cost, but can be expanded on short notice to fight a fire of conflagration size.
3. Provision and maintenance of a system of roads and trails giving practical access for fire fighting crews and equipment to any part of the forest.
4. The spotting, or location of fires at the earliest stage possible, in order that both damage and cost of extinguishing may be held to a minimum.
5. Actual fire fighting operations.

In a sparsely settled area of 160,000



Fire organization chart, illustrating the lines of authority and responsibility on a typical large fire. On small fires one person will combine the functions of several of these positions acres (250 square miles) these functions present a very real task.

In the 11 years from 1931 to 1941, inclusive, there were 138 fires in the Argonne District, 25% of which were traceable to careless smokers, 20% to lightning, 17% to debris burning, and the remainder to various causes, including 3 incendiary. The public, both local residents and tourists, has become distinctly fire conscious and now cooperates in precautionary measures much better than in previous years. This is due in great part to the educational campaigns carried on by the Forest Service. Some of the hazards, however, have increased—notably the extent of high hazard slashings which, in our district, have increased from 40 acres in 1938 to 3800 acres in 1942.

Organization for Fire Control in the Argonne District

As previously stated, authority and responsibility are centered in the District Ranger. In critical cases—especially when more than one fire threatens—he may dispatch the crews and direct the work from headquarters. When at the actual site of a fire, he is "fire boss," unless he delegates that responsibility to another.

Second in command is the Admin-

istrative Guard, who normally acts as "fire dispatcher," but may be assigned to any duty by the Ranger. In the Ranger's absence he assumes the functions of that office. Both Ranger and Administrative Guard are full time men, on duty the year around.

During the fire season (April 10th to October 31st) three "Lookouts" are employed—one for each observation tower in the district. If the "fire danger" according to the standard scale is IV, or greater, all towers are manned. If the danger is III, two towers are manned. The normal period of observation each day is from 9 A. M. to 6 P. M. When the fire danger rises to "very high" (VI), or "extreme" (VII), the towerman is on duty until dark. When not on duty in the towers, the Lookouts are assigned to such other duties as the Ranger may designate, including maintenance of buildings, roads, telephone lines and camp grounds.

The rating scale for fire dangers has been very carefully prepared on the basis of many years' experience with forest fire behavior under varying weather conditions, and other factors. The lowest danger rating is I, at which the danger of forest fire is almost negligible, and the highest

is VII, at which point every possible precaution is taken, and the entire personnel, both regular and volunteer, are geared to 100% readiness for any emergency. The ratings may vary greatly within 2 or 3 days' time.

Two work crews, totaling 16 men, are employed on full time throughout the fire season. They build and maintain roads, trails and telephone lines, set out young trees obtained from the Government nursery at Rhinelander, and treat existing tree plantations and young stands of timber to improve growing conditions and quality of the ultimate timber crop. At all times during the fire season they are on call for fire duty. When the danger rating is IV, or greater, one member of each crew remains at the portable field telephone, which is maintained as close as possible to the point where the crew is working. Crews at a distance of more than $\frac{1}{4}$ mile from a telephone line maintain communication with the fire dispatcher by means of a portable radio. These crews handle all small fires without outside assistance.

Volunteer forces occupy an important place in the fire fighting organization. First among them are nine "Key Men," who are responsible, personally instructed cooperators that can be depended upon to take initial action on fires, especially in mobilizing and outfitting crews. They are located at various points which afford a practical strategic coverage of the district. These men are the first to



Temporary tree-tower erected by CCC in 1938 in connection with mapping operations for permanent tower location

be called in the event that more than the regular crews are necessary. They are also called upon to investigate smokes or reports of fires in their immediate vicinity.

Next in line is a group of 18 "Co-operators," who assist in detecting fires and who can be depended upon for individual action within limited zones.

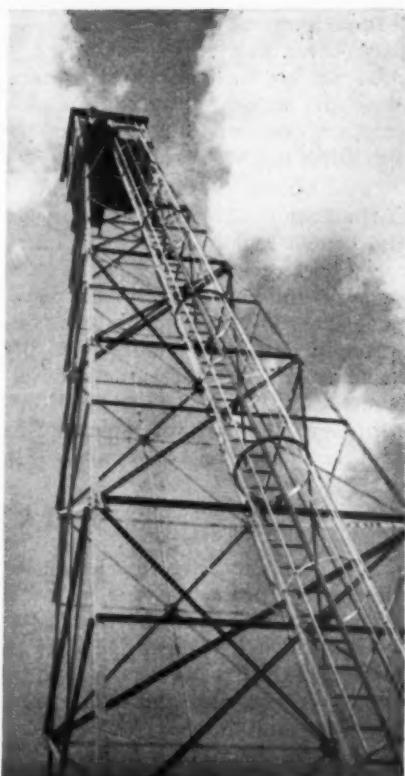
The assembling of an additional force of 200 local "Firefighters" is provided by 16 individuals and firms who are phoned as needed, and in turn call the men of their respective groups. The largest of these is at the Three Lakes Mill, where 30 men are available. Other groups number from 10 to 25 each. If still more men should be needed, they are recruited from more distant towns and cities. The ranger station and the various outlying fire tool caches have sufficient equipment for a total of 300. Additional equipment can be secured from the Forest central warehouse, or from the Regional warehouse at Milwaukee.

Members of these forces are also listed for special services. Ten men—most of them members of the "Key Man" group—are designated as foremen, who can be placed in charge of fire fighting crews; nine are trained pumper operators; seven are tractor operators; six radio operators; three cooks; and six timekeepers. Volunteer fire fighters of all classes are paid on an hourly basis.

Sources of food supply also are arranged in advance. The Argonne Ranger Station maintains a stock of 25 man-day emergency rations. Two local stores can supply 50 man-day rations each, and two larger stores can furnish unlimited supplies on one day's notice.

All of these matters are, of course, recorded in a manner to be instantly available when needed. The list of Key Men gives name, occupation and phone number, and, of prime importance, a "Map Symbol." These symbols—K-1 to K-9, inclusive, are entered on the dispatching map and show location of each man's place of business or regular work, so that the one nearest a fire can be called into service immediately when the fire is discovered. The Cooperators are listed in similar manner, with map symbols from C-1 to C-18. All Key Men and Cooperators are required to take a prescribed course of instruction and training.

Organization of crews in actual fire fighting operations is, of course, a varied and complex problem, but the following excerpts from the Regional Fire Control Handbook, issued by the



A Forest Service lookout tower
Forest Service, indicate salient factors.

"Sizes of Crews. Just like any other production job, good fire control management requires the *highest possible output per man per hour*. This has the dual effect of getting the job done more quickly and more economically. For each different type of job there is a size of crew which is ideal for the purpose. A smaller crew than the ideal may be unable to accomplish the job at all within acceptable standards; while a larger crew than necessary will lower the average output per man and increase the cost per man proportionately.

"Many years of fire fighting experience have shown that on the normal fire suppression job, one crew leader or straw boss cannot give effective supervision to more than 8 or 10 men performing a single function. Considering standardized methods of transportation and mess arrangements, as well as the unique features of the normal fire fighting job, a crew of 25 to 30 men in charge of a foreman makes an efficient, self-contained unit. Such a crew would be divided into three sub-crews each in charge of a straw boss performing such separate functions as right of way clearing, line construction, pump and hose operation, back-firing, etc. "The perimeter of the ordinary large fire is usually divided by topographic or cultural features into several sectors which can be most efficiently

(Continued on page 60)

Over 96% WATER RETENTION at 100° F

Spray It On and the Curing Job is Done

NO BURLAP • NO COTTON MATS •

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TRUSCON
TRU-CURE

***The Time and Money-Saving Method
of Curing Concrete***

Curing concrete roads leading to Ford Bomber Plant with TRUSCON TRU-CURE.

This advanced technical development meets the emergency war requirements by speeding up the job and providing:

—stronger concrete (higher compressive strength); harder concrete (greater wear resistance); sounder concrete (freedom from checks and cracks); more serviceable concrete (minimum maintenance necessary); more water-tight concrete (greater resistance to freezing and thawing).

TRUSCON TRU-CURE provides this *better con-*

crete because through its high water retention, the natural processes of hydration have had opportunity for completion. Over 96% water retention at 100° F. in first 24 hours.

TRUSCON TRU-CURE is applied immediately after finishing. Equivalent to a 14-day water cure.

Clear liquid—will not discolor concrete. No clean-up afterward. No need for bulky curing material or the time and labor costs of handling it.

Approved by United States engineers.

WRITE FOR LITERATURE to Dept. R-3 on this advanced method of curing concrete that saves time, labor, material—and does a better curing job.

TRUSCON LABORATORIES
DETROIT . . . MICHIGAN

Deletions made by Barber-Greene

Speeding Victory with Barber-Greene



B-G FINISHER laying runway for combat Bomber Assembly Plant Airport, ~~over~~ ~~over~~ ~~over~~. The B-G Finisher can remove the asphalt mix from tracks, evenly spread it, compact it to a uniform density, and automatically lays a hard surface even over an irregular sub-base.



B-G PORTABLE CONVEYOR placing materials into storage bins there. This same conveyor is also used for handling coal, grain, aggregate, and many other bulk materials of the Defense program.



B-G CAR UNLOADER. Most of these Barber-Greene machines are being used for handling coal by the U. S. Quartermaster Corps. This Barber-Greene car unloader can handle coal and is practically automatic after being started.

B-G "GOOSENECK" COAL LOADER. One of many loading units for industry and coal and other raw heating materials and airport offload both in the United States and Canada.



B-G TRAVEL PLANT mixing and asphalt for U. S. Navy. It is delivering 3 cubic yards of mixed material per minute in this picture.



B-G SNOW LOADER clearing city streets at from 10 to 20 yards per minute. This Snow Loader has proven to be essential in the Defense producing areas.

Barber-Greene

THESE machines are the products of free enterprise, developed in times of peace for normal functions. They are typical of the many ingenious results of the open competition of a democratic system. Now these very machines are working to defend the system that made them possible.

There is much more to defense than munitions . . . the building of camps, airports, roads, igloos

BARBER-GREENE COMPANY

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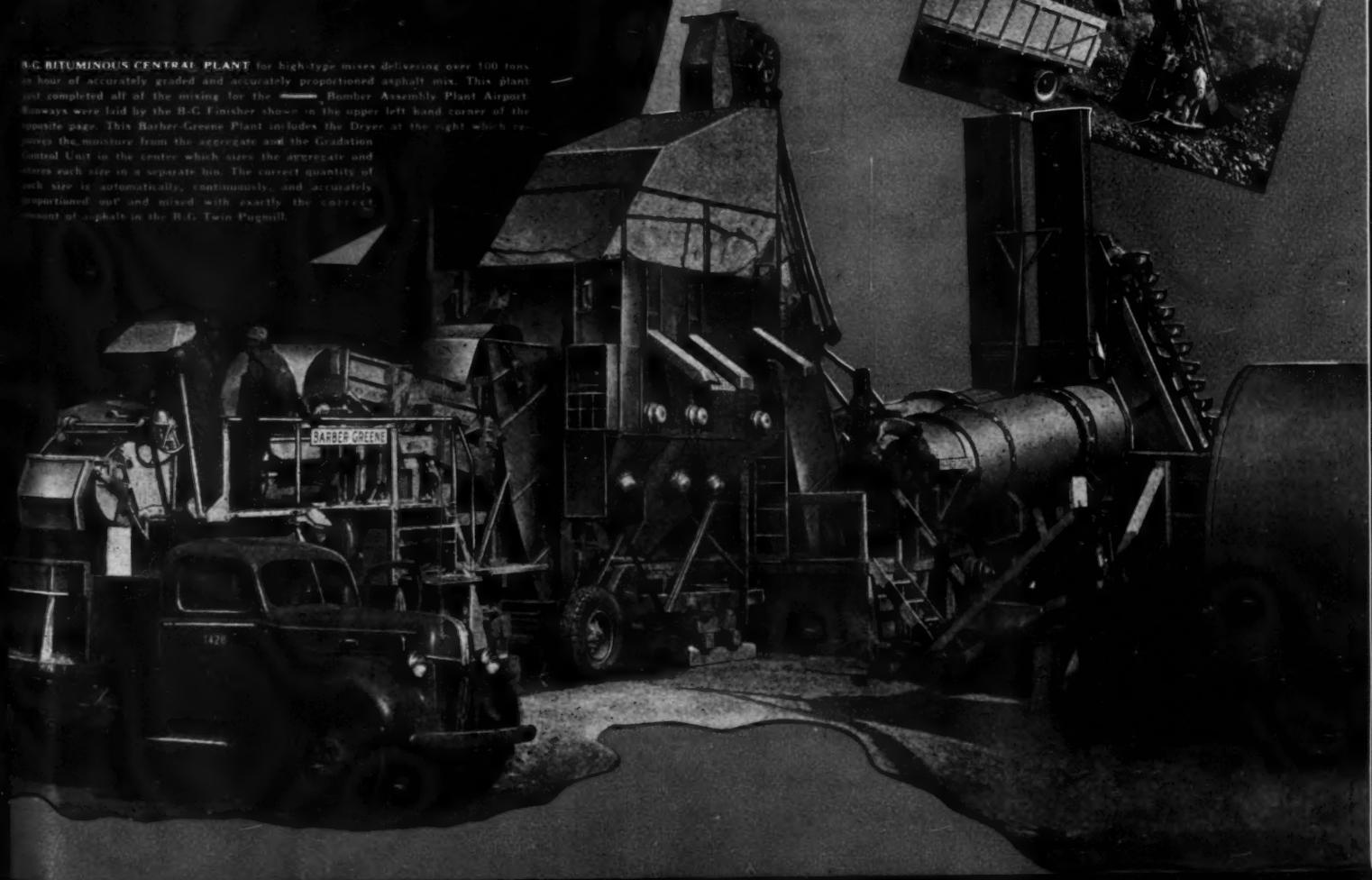
Greene Company to comply with current censorship

... with Greene

— a thousand major products — requiring almost every commodity used in our normal life — now required in a sudden rush of multiplied quantities. The ingenuity and unequalled efficiency of American products combined with the American spirit is responsible for the rapid progress of the defense program — a spirit that is showing the difference between being pushed together, and pulling together.

AURORA, ILLINOIS, U. S. A.

B-G BITUMINOUS CENTRAL PLANT for high-type mixes delivering over 100 tons an hour of accurately graded and accurately proportioned asphalt mix. This plant has completed all of the mixing for the **Bomber Assembly Plant** Airport Runways were laid by the B-G Finisher shown in the upper left hand corner of the opposite page. This Barber-Greene Plant includes the Dryer at the right which removes the moisture from the aggregate and the Gradation Control Unit in the center which sizes the aggregate and stores each size in a separate bin. The correct quantity of each size is automatically, continuously, and accurately proportioned out and mixed with exactly the correct amount of asphalt in the B-G Twin Pugmill.



B-G DITCHER Ditcher building fence posts. This machine is a self-propelled unit with a bucket mounted on a rotating arm. It is used for digging, moving, and placing material, cutting, and clearing brush.

B-G PERMANENT CONVEYORS Material handling equipment for moving material and gravel in a general construction plant.

B-G BUCKET LOADER Bucket Loader has delivered over 100,000 cubic yards per minute. The large B-G Bucket Loader has a maximum bucket capacity of 10 cubic yards.



Photo by W. J. Forsythe, USDA, Courtesy of U. S. Forest Service
Fire fighting equipment and trucks ready to leave for fire. Shown are a pick-up truck with 5-man tool cache and trailer with portable pump and half mile of hose in pack sacks, each containing 300 feet, to be carried on backs of volunteers; four-wheel drive truck and tilt-top trailer carrying tractor and fire plow; two-ton truck with portable kitchen. Rhinelander, Wisconsin, May, 1942

managed and supervised as a more or less independent unit. The action on such a sector would be in charge of a sector boss who would direct the action of from 2 to 5 crews each in charge of a foreman and containing a total of up to 125 men."

The advent of the C. C. C. (Civilian Conservation Corps) was of much benefit to the National Forests. They built and improved roads and telephone lines, assisted in the suppression of fires, built ranger station buildings, lookout towers and cabins, planted trees, improved timber stands by cutting, pruning, etc., built bridges, improved fishing streams, planted fish, and built camp grounds.

After discontinuation of the C. C. C., its equipment was assembled and turned over to the War Department, but certain trucks, tractors and plows

necessary for forest fire protection have been loaned to the Forest Service by the Army. The logic of this as a measure of national defense is found in the necessity of conserving timber for both war and peacetime needs.

Fire Fighting Tools and Equipment

The quantity and variety of machines and tools used by the Forest Service are of special interest. To begin with the smallest, there are the various caches of hand tools. The standard "10-man cache" is listed in full in Table I. In addition to this there are special caches for 2 men, 5 men and 15 men. All caches are kept in red painted, upright, sealed boxes, with rain-shedding tops. In the Argonne District, one 15-man cache and five 10-man caches are kept at the

Ranger Station, while five 10-man, six 5-man, and four 2-man caches are scattered strategically through the district. Most of them are at "Key Man" or "Cooperator" points, and all locations are clearly indicated on the dispatcher's map and record.

Two of these items not generally used outside the Forest Service require description: "Back-pack pumps" (designated "Can, B/P/W pump" in the table) are 5-gallon water cans, equipped with hand pump and straps for packing on a man's back. The 3-ft. hose is equipped with a duplex nozzle to throw either a concentrated stream or a heavy spray.

"Fusees" resemble railroad fusees, or Roman candles. They throw a flame about 8 in. long, and are used for burning out lines and starting back-fires. The burning time is 10 min.

Beside the cache outfits, there is at the Ranger Station a large assortment of tools—shovels, axes, saws, buckets, etc., estimated as sufficient for 137 men. Among these is a considerable number of "Pulaski tools," a sort of combination of axe and adz, or better, say, a glorified mattock. These are very useful in clearing out small roots and sticks which might carry fire across an otherwise good fire break. The tool has an ordinary straight axe handle, and is kept with sharp cutting edges for maximum efficiency.

For transportation there are 5 trucks at the Station:

1 International stake	1½ Ton
1 Dodge stake	1½ Ton
1 Dodge pickup	½ Ton
2 Chevrolet pickups	½ Ton



Photo by W. J. Forsythe, USDA, Courtesy of U. S. Forest Service
Tractor and Baldwin bottom plow being loaded on trailer after fire



Photo by W. J. Forsythe, USDA,
Courtesy U. S. Forest Service

The plow and its 30-in. trench. The fire-line guide ahead directs tractor and plow as close to the fire as practicable and keeps it clear of logs and boulders

If more are required, 9 trucks owned by Key Men and Cooperators are available. Hourly rental rates are agreed upon in advance, and are listed in the record with other data of similar character.

"Special Equipment," kept at the Station, is listed in Table 2. The heavy trailer is for road transport of tractors and plows. Cattle rack trailers carry miscellaneous tools and equipment. The Economy heavy duty pumper consists of a centrifugal pump, powered by a Chevrolet engine and mounted on a 2-wheel trailer. It will deliver 250 gal. per min., under ordinary fire fighting conditions. The Pacific Marine pumpers—one Type N and one Type Y—are packed in wooden cases, each of which can be handled by 2 men, or, if need be, can be taken out of the case and carried by one man as a back-pack. They are 70 and 68 lb. With each pumper goes a separate case, containing gasoline tank, oil, tools, etc. These little pumpers operate at high speed, and will deliver 63 gal. per min. at 100-lb. per sq. in. pressure. The Type Y unit will pump water up a hill 400 ft. high, using as much as 2500 ft. of hose, and still give a very effective fire stream.

Within the district are about 60

miles of Forest Service telephone lines, all 2-wire circuit. Field telephones are simply hooked to the wires by hand poles. Private phone lines traversing the area can also be used, if needed. If a crew is working far from any line, the radio is used. The sets are 2-way ultra short wave, requiring head phones.

TABLE 1.

Tools in a Standard Ten-Man Cache

Axes, D.B. 3 1/2 lb.	6
Bags, water, 5-gal.	1
Buckets, canvas	2
Burlap bags, or strips	10
Cans, B/P/w pump	4
Cans, water, 10-gal.	2
Canteens, 1-gal.	1
Canthooks	1
Files, 10"	1
Fusees	5
Hammers, 4 lb.	1
Knapsacks	1
Lanterns, electric	2
Mattocks	2
Packsacks	1
Saws, 2-man	2
Shovels, LHRP	8
Wedges	1

TABLE 2.

Special Equipment

Tilt-top trailer	1
Cletrac "25" tractor	1
Killifer plow	1
Economy heavy duty pumper	1
Pacific-Marine pumpers	2
Hose, rubber lined	3150 ft.
Hose, lined	2800 ft.
Mess outfits, 25-man	3
Mess outfits, 10-man	1
Mess outfits, 6-man	1
Blankets, single	275
Blankets, double	170

TABLE 3.

Grading and Road Equipment

At Argonne Station:	
1 Gallon, 12 ft. motor grader	
1 Adams, 12 ft. pull grader (hydro control)	
1 Isaacson, 3-tooth road ripper	
2 Adams rotary frefnos	
1 Allis-Chalmers, 25 h.p. tractor (chiefly for fire services)	
1 Cletrac, 35 h.p. tractor (chiefly for fire services)	
Available from Nicolet Forest Headquarters at Rhinelander:	
1 Gar Wood trailbuilder	
1 Caterpillar, 50 h.p. tractor	
1 P & H 1/4-yard shovel	
1 Dragline	
1 Lippman rock crusher	
1 Cletrac, 55 h.p. tractor, with double cable drum for dragline	
1 Gar Wood, 8-yard scraper	

Towers—Telephone—Radio—
Weather Instruments—Maps

Three main lookout towers, known as Julia, Nettleton and Hiles are located as shown on the map. They are of steel construction, 100 feet high, situated on high ground, and in clear weather afford a practical observation range of 12 to 15 miles. All were built by the C. C. C. An auxiliary tower 57 ft. high and about 6 miles from the Hiles tower, is provided

for use during periods of poor visibility.

The essential equipment in the cab of each tower is an alidade, or direction finder, 20 inches in diameter, with vernier reading to the nearest one minute of arc, and provided with sights like those of an old fashioned surveyor's compass. The zero of the alidade is set at true north and the azimuth of any smoke is measured therefrom. A map of the area, with



Photo by W. J. Forsythe, USDA,
Courtesy U. S. Forest Service

Strawboss operating portable telephone. Connection has been made through the long stick, which is hooked over wire



Photo by W. J. Forsythe, USDA,
Courtesy U. S. Forest Service

Portable radio and crew. The strawboss is handing in a report for transmittal to headquarters



Photo by W. J. Forsythe, USDA, Courtesy of U. S. Forest Service

Locating fire and dispatching crew. On the wall map, the center of each circle marks the location of a lookout tower. Circles are graduated in azimuths, and strings stretched from their centers indicate direction of fire. Intersection of strings on the map gives location of fire. This picture shows Esther Intermill, wife of a Forest Service Ranger, receiving instructions in the dispatch of fire crews from David Kee, dispatcher. If needed, Kee would serve as foreman at fire

the tower at its center, is pasted within the circle of the alidade. Scale of map is 1 inch to the mile.

Each tower is, of course, provided with a telephone, and at the Julia tower, which has under observation the largest and most hazardous fire areas in the district, there is an ultra-short wave radio for both sending and receiving. This set can maintain contact with a portable radio carried by the fire crew in any of these different areas, and in fact, at any point on the ground throughout the greater part of the district. Communication between the fire boss at the fire and the dispatcher at the Ranger Station is by radio between the fire and the tower, and by telephone between tower and station.

Office equipment at the Ranger Station includes telephones; radio; maps of the district to a scale of 1 inch to the mile, marked with sections and quarter-sections, roads, lakes, streams, and as previously mentioned, the locations of all volunteer fire fighters, caches, etc.; aerial survey maps to approximately the same scale—very useful for detailed information of all sorts; weather instruments—thermometers, fan psychrometer, rain gauge, anemometer and weather vane.

in this area. In fact, as forest fires are never twice alike, there would be no limit if we were to attempt a complete description.

Excepting fires started by lightning, all forest fires start on the ground and in most cases, they can be held there. The alarm may be phoned in by a farmer, or by anyone who happens to note the start of a fire, but in most cases it comes from a lookout in one of the towers, who sees a suspicious smoke, takes its azimuth with his instrument and estimates its distance from the tower. The dispatcher phones the general location to another tower, and as soon as the second lookout sights and takes its azimuth, the exact location is determined by the intersection of the two lines of sight on the dispatcher's map.

Low, medium and high hazard areas for the entire district are shown on a map in the Ranger's office. The high hazards are generally areas where there are slashings—or logging refuse—most often on privately owned lands. Considering the hazard for the particular area and the general "degree" of fire danger, the dispatcher estimates the number of men that should be sent out. Fires are regularly rated as "5-man," "10-man," "40-man," etc., according to the number estimated as necessary to suppress them. The first crew sent may be one of the road gangs, or it may go directly from the ranger station, or the nearest "Key Man" or

Fighting Fires in the Argonne District

It is impractical in the space here available, to describe in detail, all the methods used to suppress fires



Photo by W. J. Forsythe, USDA, Courtesy of U. S. Forest Service
Strawbosses and foremen get final instructions from fire boss with map

not "too little and too late"
but *Much...on time*

Without realizing it—we, the least warlike of nations, have long been readying ourselves for war.

We have not yet hit our production stride. But we will—soon. And our success, when it comes, will be the success of *preparation in advance of the need*.

Preformed Wire Rope is one example, duplicated in scores of other industries.

First introduced in 1924, Preformed gradually sold itself to industry by doing more work, with greater safety, for less money.

Today when *more work, with greater safety, for less money* is a war production "must", Preformed is in demand throughout the nation.

Furthermore, Preformed, because it lasts longer, saves an important tonnage of steel.

All this is a tribute to American thinking and doing. It is typical of thousands of American products in different channels of production.

Preformed wire rope

One of America's Industrial Pacemakers

ASK YOUR OWN WIRE ROPE MANUFACTURER OR SUPPLIER
ROADS AND STREETS, September, 1942





Photo by W. J. Forsythe, USDA, Courtesy U. S. Forest Service
Pumper and hose crew packing equipment to water supply

"Cooperator" may be instructed to make the first attack. Other crews follow as may be deemed necessary. Complete knowledge and good maps of the roads and trails, are, of course, necessary to get the most efficient response.

Constructing the Control Line: The Baldwin plow and tractor are sent to all fires except in swamps, where such equipment cannot operate. A power pumper and 2000 feet of fire hose is also sent out. Immediately on arriving, the fire boss determines the line on which he will attempt to hold the fire. To save needless waste, this line must be as close to the fire as practical, and yet not so close that the fire is likely to reach it at any point, ahead of the crew. On slow burning fires it is sometimes possible to build the line at the very edge of the fire. This is known as the "Direct Method" of attack.

The fire is attacked at its head if possible, the first measure usually being to knock down the hottest and fastest traveling part. Then the control line is built along the entire remaining front. It is started at or near the head and extended along the flank to the rear of the fire.

The line, as constructed, consists of a trench, dug down to mineral soil. It may be built by hand, using shovels, mattocks and axes—often the only tools available at the outset—or it may be made with the tractor-drawn fire plow or cut with the stream from the power pumper. Lines built by hand are 12 to 14 inches wide; but the plowed fire line is 30 inches wide and is proportionately more effective in reducing the chances of fire jumping across. Sometimes a combination of plow and hose stream is used.

However the trench may be dug, it is vital that no line of combustible material shall be left across it. There-

fore, a man with a Pulaski tool or mattock, follows the plow or the hose, digging deeper at any point where necessary, cutting off any roots which may be left, throwing out any sticks, moss or other combustible material which may have fallen into the trench after it was dug, and clearing such material from the edge, if it is in danger of falling in. The same precautions are, of course, taken with hand-dug trenches.

Because no two cases are alike, it is difficult to state the speed at which such work can be done. However, 40 feet per man-hour is a reasonable rate for a hand crew of 20 men, under moderate conditions. Timing of the Baldwin plow pulled by the 25 h.p. tractor, while working in fairly rough areas—hills with moderate undergrowth and occasional down logs—showed a rate of $\frac{1}{4}$ to $\frac{1}{2}$ mile per hour.

Length of Work Shift: Regarding length of shift and efficiency of work, the Fire Control Handbook has this to say:

"In any effort to increase the output of work per man hour, the limitations of physical endurance must be taken into account. Speed being the most important single element in fire control, it is important to attain the highest possible rate of production in the first few hours after attack rather than to plan for sustained production over a longer period of time. The endurance of men is directly related to the speed of work and the length of time involved.

"It is therefore better practice to work men under high pressure for a short shift (not more than 6 hours) than to carry on at a moderate rate of speed for long periods of 10 or 12 hours, or more. This not only insures control of the fire within the shortest possible space of time but improves

the morale of the men by enabling them to finish and forget a distasteful job in the least possible space of time. "The principle applies in the main to the strenuous labor of fire line construction up to the moment of control. Certain phases of the job, such as patrol and mop-up operations, are not by nature particularly strenuous and do not offer any particular reason for departing from the standard working day of 8 to 10 hours. Also, the exigencies of a given situation sometimes require all the men available to remain at a critical post of duty for long periods because of failure of reinforcements to arrive, or other sufficient reasons. The effort in organization should, however, be toward the short shift."

The handbook also points out that on fires where a large amount of mechanical equipment is used, a skilled mechanic is necessary to maintain all units in proper running order, and that on large fires an expert tool grinder adds greatly to the efficiency of the organization.

The "One-Lick Method": A recent development in the technic of con-



Photo by W. J. Forsythe, USDA,
Courtesy U. S. Forest Service
Hose attached to pump, and hose packer
ready to start laying first segment. Pack
contains 300 feet of hose



How can you beat it?

(Midnight on the Albany Post Road, as the big Mack, "Honeygirl," rolls back onto the job out of an all night eatery. Sketched from life by Peter Helck.)

THE VERY FIRST MACK ever built stayed in service for 17 years. The ninth Mack, built in 1901, is still in running condition, although retired after a million miles of service. Right now, 7 of every 10 Mack trucks built 10 years ago are still on the job. How can you beat a record like that? Where else can you find trucks equal to these? The answer's simple — *you can't!* From one ton to forty-five tons, a Mack is your *best* truck in the end because a Mack is *more* truck to begin with!

Mack Trucks, Inc., Long Island City, N. Y.

Plants at Allentown, Pa., New Brunswick, N. J., Plainfield, N. J.;
Factory branches and dealers in all principal cities for service and parts.

Mack
TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

BUY U. S. WAR BONDS

IF YOU'VE GOT A MACK, YOU'RE LUCKY... IF YOU PLAN TO GET ONE, YOU'RE WISE!

ROADS AND STREETS, September, 1942



Photo by W. J. Forsythe, USDA, Courtesy U. S. Forest Service

Mopping up the edge of a fire. Note that the plow has already passed this point

structing fire lines by hand is what is known as the "Progressive Method," or as it is sometimes called, the "One-Lick Method." Under this system, the crew moves rapidly along the line in single file, the lead man setting the pace, cutting a root here, a branch there, but not stopping to follow up or complete any single operation. Number two man follows in the same manner, and the others likewise, so that by the time the file has passed, the line is fully constructed, although, in a general way no one except the file closer (who may have to do a bit of finish work here and there) has taken more than "one lick" at any one point. It will be noted immediately that this method is essentially that used in mass production in industry; and the fact is that it actually does effect a large increase in production per man-hour. While the "One-Lick Method" probably never will completely displace the older methods, its use is growing rapidly. The number of men required ranges from 5 up to 40, the tools, spacing of men, etc., varying according to con-

ditions. Selection of tools is perhaps the most important single factor.

Snags and Back Firing: Burning snags are felled wherever possible. This is particularly important, as sparks blowing from them are among the commonest causes of fires crossing fire lines. Snags which are in imminent danger of catching fire also are felled, as time and men are available.

"Back-firing" is a striking term which catches the public fancy, but which actually is seldom used. It requires great skill and fine judgment, and is definitely a last resort method. The term "back-fire" must not be confused with the "burning out" of a line—a term used to indicate the burning off of combustible material along the inside edge of a constructed line, as a further insurance of its effectiveness. The fuzees, mentioned in the list of equipment, are used for this purpose.

Use of Water: The following paragraphs are from the Fire Control Handbook.

"The most obvious and efficient

means of actually extinguishing a fire is by the use of water. In forest fire suppression, the location of the fire with respect to a water supply controls its usefulness in each individual case. Very often the expense or loss of time involved in transporting water to the fire in sufficient quantities to be effective precludes its use at all. In other cases there is a margin for judgment, and the fire boss must decide whether the use of water is more economical and efficient than some other means of suppression.

"The use of water is valuable for:

- (a) Quieting down particularly hot spots so that men can work close to the fire, using the direct method or the 2 foot method,* where otherwise it would be necessary to use the parallel method.†
- (b) Extinguishing spot fires or wetting down an area where sparks are flying.

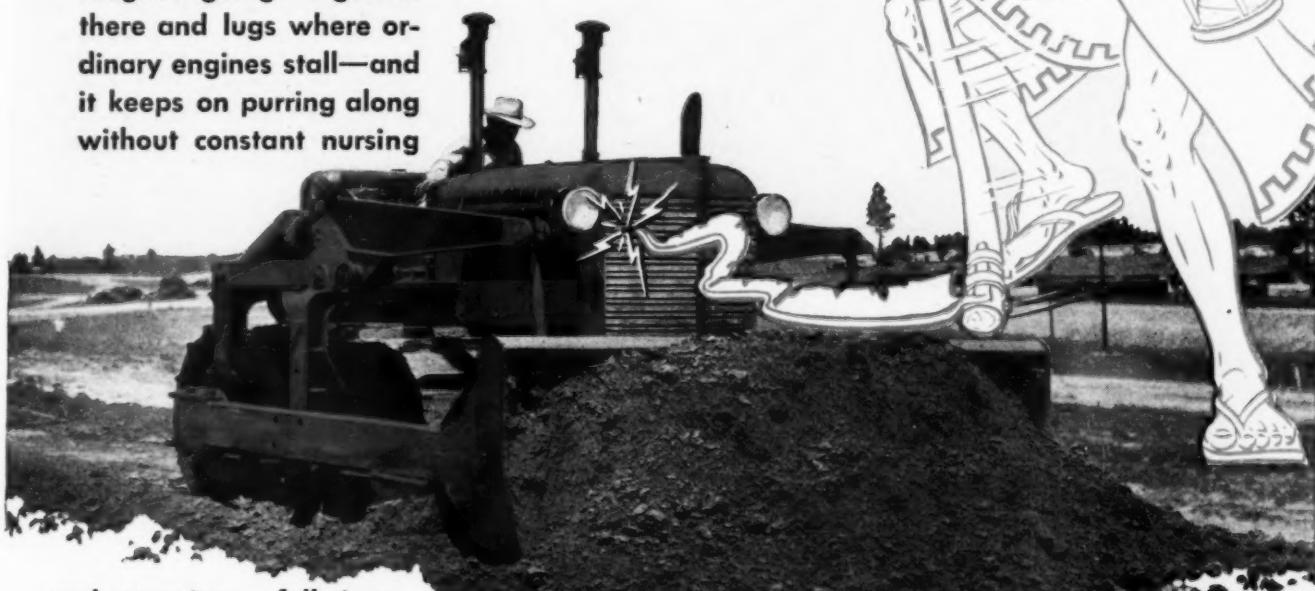
* A method in which the control line is constructed about 2 ft. from the burning edge of the fire.

† A method in which the control line is constructed at a distance more than 2 ft. from the burning edge of the fire.

2-CYCLE DIESEL!

It's Husky! It's Sturdy! It's Tough!

It's the most outstanding Diesel in the construction industry, this hard-hitting, double-powered, 2-cycle engine. It "packs a real wallop" that carries it through the toughest going—it gets in there and lugs where ordinary engines stall—and it keeps on purring along without constant nursing.



and attention, a full sixty minute hour . . . 24 hours per day . . . if necessary.

Service records indicate thousands of hours of operation without overhauls or major repairs on tough, three shift jobs. That's the kind of service Allis-Chalmers tractor owners are getting from their 2-Cycle Diesels. It's the kind of performance that gets jobs finished on time and at less cost — the kind of performance you've always wanted in a tractor engine — the kind of performance only a 2-Cycle Diesel can give you.

If you are not already a 2-Cycle Diesel owner, it will pay you to check up on this modern power. Be prepared for the future. Write for complete information.

ALLIS-CHALMERS
TRACTOR DIVISION MILWAUKEE, U.S.A.

2-Cycle
THE MODERN
DIESEL POWER



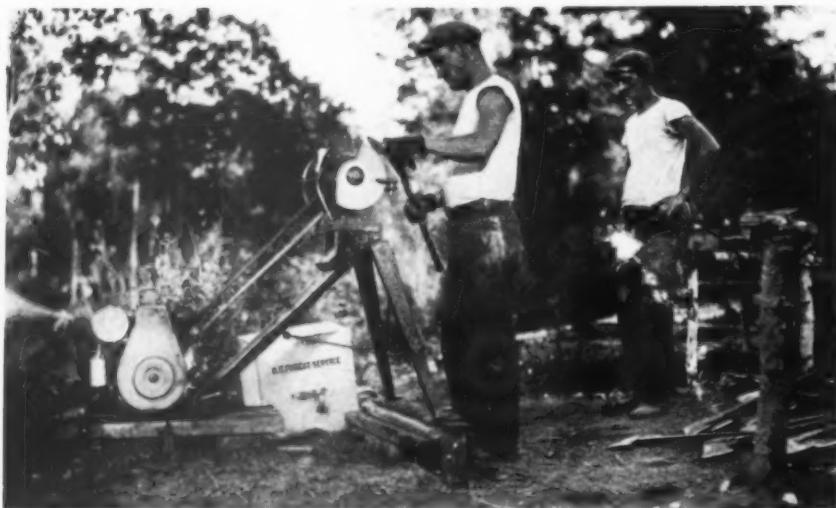
JOB SHORT-CUT WINNER

\$5 to Fred Goett, 841 E. 67th St., Seattle, Washington, for the Following Short-cut Method:

"One winter we had a pile of muck to get off the grade. It was too deep to get a tractor through it. All we could do was push it up a little and that made it worse. So we took two A-C's, one HD-10 and an LO, both with angle dozers. We angled the blades and worked the machines side by side. The blades were angled so they formed a point (illustration). The two angle dozers went through the muck pile and worked it down to solid footing so the other dozers could get rid of it. It worked good."



You, too, can win \$5 and at the same time help the war effort! Send in your Job Short-Cut suggestions and ideas on How To Make Tractors and Graders Last Longer. Allis-Chalmers will pay \$5 for each suggestion accepted for publication in future advertisements.



Portable gasoline tool grinder in service U. S. Forest Service Photo

- (c) Holding a sector of hot line temporarily until an adequate crew can be placed on it to construct a proper control line.
- (d) Completely extinguishing persistent patches of fire in snags, logs, peat beds, and similar out-of-the-way places, which are difficult to get at by other methods.

"The use of water may often give a

sense of false security in that it may reduce a live flame to an unnoticeable smouldering ember which escapes detection as long as it is moist, but will come to life later when it dries out, perhaps after the fire or sector has been abandoned as "out." To avoid such a catastrophe it is always important to dig up and spread out smouldering material which is

tightly matted, to insure that the water reaches all parts."

"In many cases a man can control 50 yards of fire line with a shovel or other hand tool, in less time than it would take to pack enough water to control 10 yards.

Beating or Raking: "Very often a fire in light fuels, such as grass, weeds, leaves or light brush, can be entirely extinguished by beating with boughs, wet gunny sacks, or specially designed swatters. In many surface fires in the hardwood types, the fuel consists almost entirely of dead leaves and complete control may be accomplished merely by raking a clean path through the leaves at the edge of the fire. In many such cases where the humus layer is very thin or non-existent due to repeated burnings in the past, a fire line sufficient to stop the surface fire is all that is required. In other words it may not always be necessary to dig an actual trench to accomplish control."

A cardinal rule with forest fires, as with city fires, is never to leave the site until the fire is positively and completely out.

(To be concluded in October issue)

Dedicate Highway System at Ford Willow Run Bomber Plant

Saturday, September 12, Undersecretary of War, Robert P. Patterson, speaking at the dedication of the \$5,000,000 highway system at the huge Ford Willow Run bomber plant, said that "one day soon" the bombers to

be produced at the Willow Run plant "will jam the 'air roads' to Tokyo and Berlin."

When plans for the Ford Willow Run plant were drawn up the Michigan State Highway Department was

called upon to prepare an emergency plan for ingress and egress to the Ford Willow Run bomber plant. The highways are complicated in design and required three-level crossings.

Roads Are Sprinkled to Save Tires

At Moberly, Missouri, they are saving tires by wetting the roads. Gravelled roads on property of a coal mine are sprinkled with water to reduce the heat of running tires and save the wear caused by friction heat.

Army Buys Vehicles

Recently the Army purchased in one day 880,000 trucks and trailers of various types in 64 separate contracts with 41 manufacturers. Total cost of these vehicles exceeds \$1,500,000,000 and many will have wood bodies to conserve critical metals.

To Dismantle Bridge

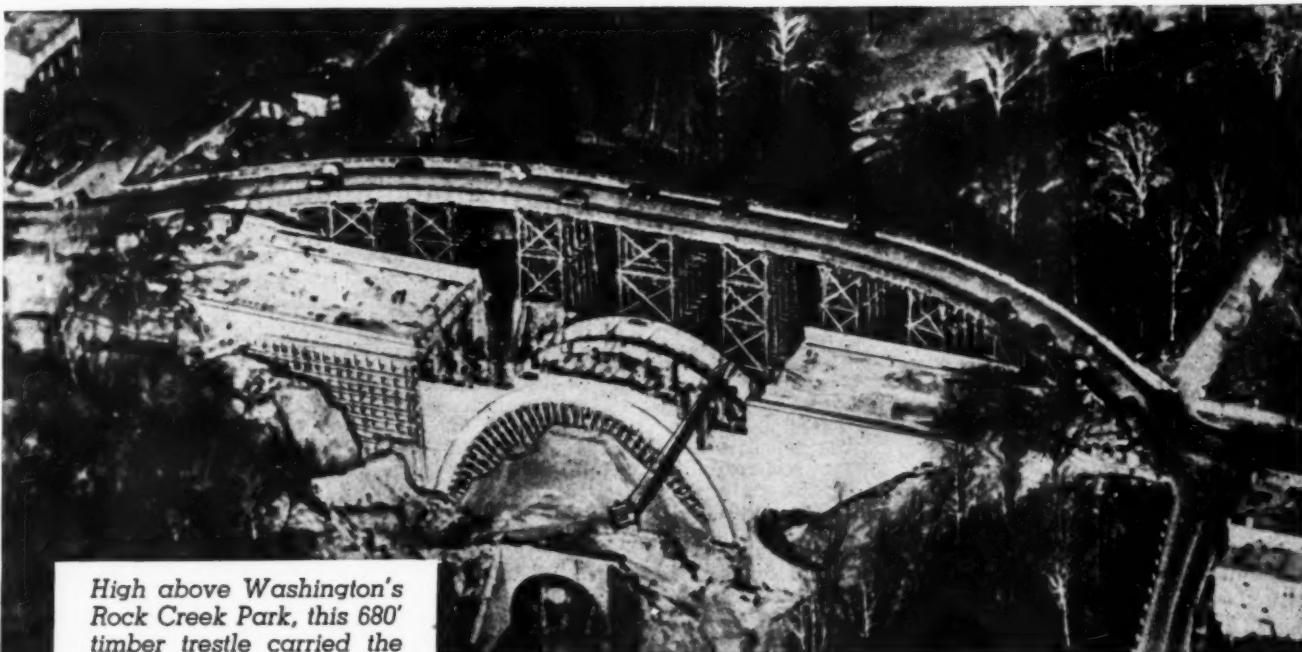
According to a report from Tacoma, Wash., the Washington Toll Bridge Authority has been unable so far to get anyone to dismantle the 3,600-ton towers and 3,800-ton cables of the collapsed Tacoma Narrows bridge. One company bid on the job recently and instead of offering the state money for the scrap, wanted \$450,000 and the steel to do the job.



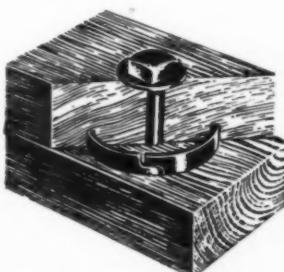
Group of Michigan State Highway Officials inspecting equipment for applying transparent concrete curing compound at the start of pouring on new road in the immense Ford Bomber, Willow Run, Traffic Project. Curing compound used on this job was Truscon Tru-Cure. Reading from left to right: Homer Cash, State Highway Construction Engineer; Keith Baguley, Project Engineer; M. H. Goldsmith, Office Manager for Oak Construction Co., Royal Oak, the highway contractor; H. Foss, Superintendent for Oak Construction Co.; J. M. McCavey, Sec.-Treas. Oak Construction Co.; Clarence Sandin, State Slab Inspector



Timber PREVENTS HARDENING OF TRAFFIC ARTERY



High above Washington's Rock Creek Park, this 680' timber trestle carried the Capitol's heaviest daily traffic burden while the new Massachusetts Avenue Bridge went up beside it. TECO Connectors gave the towering structure necessary rigidity.



The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

This trestle . . . another conclusive proof that "timber can take it" . . . was supported by 16 bents. Four-inch toothed TECO Ring Connectors were used at the sill, pile and post joints, and to join the split caps to the posts at the top. Only improved timber engineering formulae and the TECO System of prefabrication make a job like this possible.

Timber ENGINEERING COMPANY

WASHINGTON, D. C.

PORTLAND, OREGON

Editorial

Industry and the Draft

MAJOR GENERAL LEWIS B. HERSHEY, Director of Selective Service, urges every employer to make an immediate appraisal and inventory of his manpower. It is obvious that every business head should know how many men between the ages of eighteen and forty-five are on his payroll and should investigate the draft status of each. On the basis of this inventory, he should plan ahead, and train others for replacement of those who must necessarily enter the armed forces. Replacements should be made from those not likely to be drafted immediately. The local Selective Service Board will familiarize employers with its fundamental principles in classifying men subject to draft. Older men, women, men physically handicapped, or men with a high degree of dependency are best suited for the replacements.

With the time coming when eighteen and nineteen-year-olds and married men without children are going to be taken, employers must plan with the greatest care, for they will have left only men over forty-five and fathers of dependent families. Of course there are certain jobs in which women can be used, and the problem in such cases becomes simpler.

General Hershey points out that employers can ask for 30, 60 and 90 day temporary deferments in order to train new replacement employees who will not be liable for early induction. In certain exceptional cases such deferments may be extended to six months, but in no case will deferments exceed this limit. These are cases where it can be definitely shown that a very long time is required to train a replacement for some particularly difficult job. For example, the army has to train a bomber pilot in eight months, and feels that it is only fair for industry to attempt to do as much.

Here is a detailed statement of the situation recently issued under authorization from General Hershey:

Employer's Responsibility. — Employers may seek the deferment of their necessary men with or without their consent.

Here is how they go about it.

On page 3 of the Selective Service Questionnaire (Form 40) which is

sent to each registrant before he is classified is the following:

INSTRUCTIONS.—IF YOUR EMPLOYER BELIEVES THAT YOU ARE A NECESSARY MAN IN A NECESSARY OCCUPATION, IT IS HIS DUTY TO FILL OUT FORM 42A REQUESTING YOUR DEFERMENT. YOU MAY ALSO ATTACH TO THIS PAGE ANY FURTHER STATEMENT BY YOURSELF WHICH YOU THINK THE LOCAL BOARD SHOULD CONSIDER IN DETERMINING YOUR CLASSIFICATION. SUCH STATEMENT WILL THEN BECOME A PART OF THE QUESTIONNAIRE.

This is on all the questionnaires distributed during the past six months. The fact that the Selective Service System now specifically mentions the filing of Form 42A as the manufacturer's duty is a clear indication of the Selective Service System view on the responsibility of each employer in this matter.

The employer can secure Form 42A at the local board and the local board will consider the employer's request when the form is properly filled out and signed.

If such request should be denied because the man, after consideration of the claims offered for him, is not considered to be indispensable to the company's operation, and is needed more in the armed services, the local board will advise the employer of its refusal of such an occupational deferment.

May Make Appeal. — There are ten days after Form 59 is mailed by the local board to the employer during which the employer can appeal the registrant's case.

The registrant will not be ordered to report for induction during this ten-day period.

In order to take an appeal the employer simply has to sign his name to Form 59 which he has received, and return it to the local board; or in case the Form 59 is not received from the local board, any written request will have full value to make such an appeal effective.

When Form 59 is returned by the employer the appeal procedure becomes automatic.

All necessary forms are available at the local board in the employer's immediate vicinity or at the office of the State Director of Selective Service.

If the local board and the appeal board deny the appeal for the occupational deferment of a key man, the employer may then bring the matter to the attention of the State Director at the State Selective Service Headquarters, with the request that the case be reopened or appealed by him to the President.

Definite Duty. — A double duty rests upon the employer. He should personally know what his manpower situation is. He should not leave the

job to a minor employee to decide who is necessary. The employer who delegates the task of filing a request for deferment to a clerk, the executive who does not make a complete inventory of his whole plant today, is negligent. Likewise, the employer who files requests for deferment of men who can be replaced by women, or others, is keeping reinforcements out of an Army which is battling for us all. The employer engaged in essential war production who has been required to greatly expand his plant and who then fails to request deferment for his key men is also negligent.

A good rule to follow: Don't ask deferments for any men who can be replaced by training another individual not likely to be eligible soon for service in the armed forces.

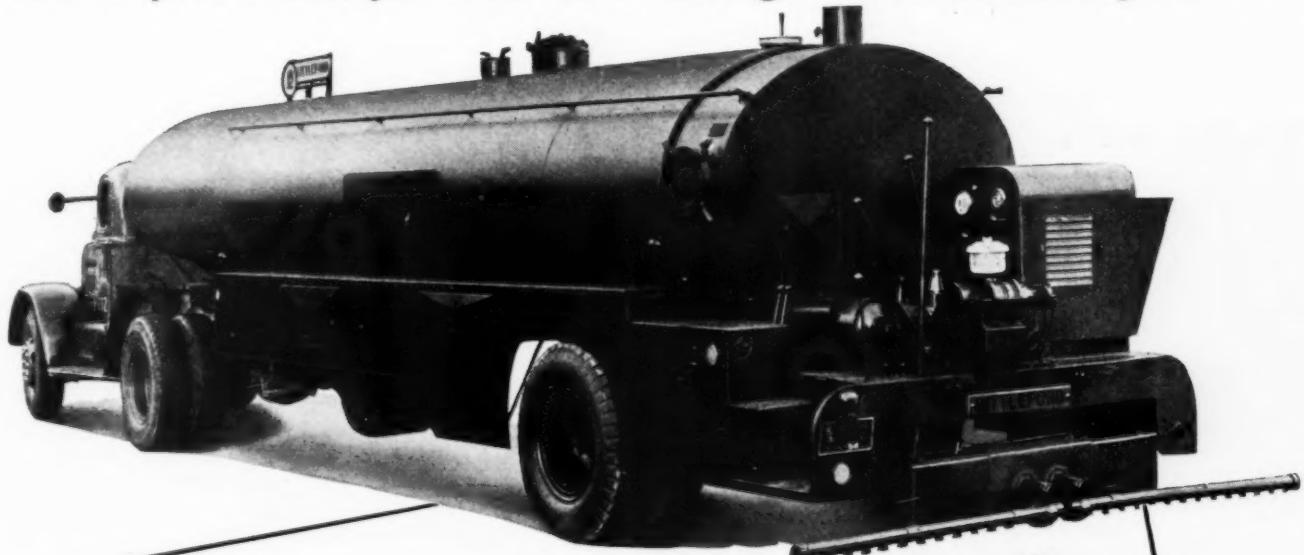
Make an inventory, request deferment for any man whose immediate going into the armed services would retard production of vital war material or other services essential to the war effort, or who is needed to maintain national health, safety and interest.

Only when an employee is working in a critical occupation within an essential industry should a Form 42A be filed for his temporary occupational deferment.

Make Replacements. — Yes, an inventory within a man's own plant is called for; also an appraisal and analysis of the manpower in the community. There is many a man over 45, or a man physically handicapped, or a woman who can do that job that the 23-year-old boy is doing who took a 12-weeks course at a learn-quick school.

There are not more than sixty million people in this country who are capable of effective productive effort. These men and women represent our total manpower available to win the war. They must do everything that must be done in a total war; maintain transportation, communications and utility systems, maintain public services, grow food for ourselves and our allies, mine the metals and produce the raw materials, fabricate and produce the amount of consumers goods necessary to maintain even a restricted national life and the supplies, weapons and munitions of war; also most of all they must provide the men who land on strange shores in far places, the men who carry the fight to the enemy on a multitude of far-flung frontiers. The rest of the population who mine raw materials and produce the weapons with which these men fight must be a self-disciplined team working in unity. The individual personal convenience, comfort or pleasure, or the convenience and ordinary leisurely replacement programs of the employer, will have to be given progressively less consideration as the war gets tougher and the casualty lists grow.

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Two Pertinent Comments on Our Article— "A Trans-African Road for War"

Mr. Halbert P. Gillette, Editor

Dear Mr. Gillette:

In the current August issue of "Roads and Streets," Volume 85—No. 8, August, 1942, Page 54, there is an article written by you which is most appropriate and timely. This article is headed "Needed: A Trans-African Road for War."

I have read the article with a great deal of interest, due to the fact that I spent two years, just following World War I, in this particular territory, making extensive surveys for prospective highways, covering the north part of the Congo Belge and the south part of French Equatorial Africa, the southern part of the Anglo Egyptian Sudan and parts of French and British Nigeria and what was formerly the Cameroons.

While I was making a study of transportation conditions in the Congo Belge and in the North Congo, I found that in the neighborhood of Stanleyville and the back country, north of that town, merchants were counting on an elapse of twelve months before the produce could reach the ocean port of Matadi at the head of ocean-steamer navigation on the Congo. This lead me in a number of directions, and I finally proposed a series of highways connecting Stanleyville with the navigable Nile and Lake Chad in Nigeria, with the Nile also, which would give an outlet if connected by the British with whom I had an agreement, to a port on the Red Sea. This would allow merchandise to reach Marseilles in France in not over three weeks.

The value of a trans-continental road in this section was so apparent at that time (1920) that I deemed it expedient to get all the information possible and to communicate with the persons who should be vitally interested in such a project, as I realized that at some future date, this highway system would be of tremendous military value. Having served as an officer in the last war in France, I saw possibilities that might not be apparent to civilians. I believe that now this information should be used immediately and I am delighted to see your article taking up what has been one of my pet projects for the past twenty years.

I spent two years in studying the terrain and the various possible routes to be taken to make connections from East to West or West to East, for both military and commer-

cial purposes, and not only know the natives in this section, and their language, but I am known to them, which is highly important in going to a country of this kind.

I see no reason why there should be a shortage of native labor in this area and have found them quite intelligent if properly led and directed.

Connections could be made through British East and to the proposed highway from the Cape, north toward Alexandria, also to the French railroad from the French Congo, north across the Sahara—plans of which I have studied in the Congo. There is one good stretch of road in the north Congo which might be utilized as a part of this highway which was built by Belgian engineers, and a portion of my connection with the Nile has been built and put into operation to my certain knowledge, as I have known at least one man who has traveled over it by automobile from Stanleyville to a port on the Nile, about 5 kilometers north of the old Port of Rejaff. This change was made down the river to assure water for port traffic on the Nile, as at times, during a very dry season, Rejaff cannot be reached.

Your suggestion of American engineers and equipment is most timely and I heartily agree that this road should be started not only from both ends, but in the middle, working both ways, carrying four working parties if possible.

The country is not difficult. Part of it, through the North Congo is park land; i.e., not dense forest, and the gradients are not bad or insurmountable, though of course, there are mountains in the lake country in the northeast Congo practically covered with dense forests which would require a great deal of work so far as clearing is concerned. Fortunately for this project, the Congo Belge is now one of our Allies and I believe that there would be very little opposition from some of the French in French Equatorial Africa.

If there is anything further that I can do to assist in putting this proposition forward, I will be only too glad to do so and congratulate you again on a long step in the right direction in putting it before the public. At present, I am the Highway Engineer of Baltimore County, Maryland, and as such, can be reached at the Court House, Towson, at almost any time.

I trust that this rather lengthy letter will be of value, as it is offered

in a spirit of trying to win the War. Should you desire the use of my services in that particular country, I will be very glad to undertake another expedition to assist in putting this very well worthwhile project through.

Very truly yours,

Herman F. Meyer, Jr.
Roads Engineer,
Baltimore County
Highways Department,
Towson, Md.
Aug. 27, 1942

Mr. Halbert P. Gillette, Editor

Dear Mr. Gillette:

In your editorial in "Roads and Streets" of August, 1942, entitled, "Needed: A Trans-African Road for War," you state, "The proposed trans-African road would cross French Equatorial Africa, but this should not be allowed to interfere with its construction. Madagascar, the great island of the East coast of Africa, is all French territory but the British took possession of it several months ago for the duration."

The above quotation, we wish to point out is very misleading, possibly due to misinformation and lack of discrimination between the Vichy Government which is under the iron heel of Germany, and a vassal of Hitler and the Free French Government, that is fighting the common enemy, carrying on valiantly with the United Nations for the restoration of democracy. This paragraph in your editorial implies that French equatorial Africa or the Free French government would object to this project, and by so doing impede the work. On the contrary, we have every reason to believe that the French equatorial Africa, being Free French and therefore an ally in the war against the axis, would do nothing of the sort.

The Free French Equatorial Africa, is composed of the Tchad Territories, the Cameroons, the Gaboon, the Oubangui-Chari, the middle Congo, etc., an area, the size of which constitutes a fourth of the French colonial empire. This entire territory is and has been, since the fall and capitulation of France, Free French territory, under the rule and guidance of General De Gaulle.

Right of way for roads, railroads, airfields, or bases of any sort, have been repeatedly offered to the U. S. government by General De Gaulle, and as you realize this territory, which is manned and defended by the Fighting French force, provides a solid Anti-Axis stretch from coast to coast, through the center of Africa.

Roads are now in existence (such as they are), from Doualla to Sudan,

and we would like to point out, that these roads were used for the transportation of men and materials to the starting point of the campaigns and conquests by the Free French troops and the capture of Keren, Italian Somaliland, Sidi-Barani, Bardia and that a column starting from Lake Tchad headed by Colonel Ornano, traveled 1600 miles across a desert, toward Southern Libya, taking Murzuck and Kufra. Another column, commanded by General Gentilhomme, comprised of Senegalese Infantry, foreign legion, motorized units, turned eastward and helped in the conquest of Eritrea. These columns starting from the center of Africa had been supplied by material transported from the Atlantic sea-coast. All these supplies had been transported to Lake Tchad either by motor over existing roads or by flat bottom river boats.

As you well realize, it is feasible and not very costly, to build roads and bases through Free French equa-

torial Africa to the Sudan, the Nile and the Red Sea, thereby saving about 8000 miles of shipping. The roads can be built very easily over, or as an addition to the existing roadway. These roads will more than pay for themselves in a very short time. Plans, maps and references are available at the "Delegation de la France Libre Aux Etats Unis" at 626 Fifth Ave., N. Y. C.

Let me assure you, Mr. Gillette, that there will be no interference from the Fighting French government and that on the contrary, they will do all possible to aid the U. S. to construct and complete this work and exert every effort in their power to help the war efforts of the United Nations, to victory and peace.

Yours very truly,

Jean A. Lamoureux,
Inter-County Supply Co.
101 Park Ave.
New York, N. Y.
Aug. 28, 1942

Truck Maintenance on a National Basis

Thousands of truck owners already have joined the U. S. Truck Conservation Corps by signing the pledge to practice preventive maintenance as outlined by the Office of Defense Transportation, and additional thousands are signing up daily, according to a current announcement of the ODT.

Officials interpreted the interest being shown in the Truck Conservation Corps plan as proof that the owners of the country's 5,000,000 motor trucks are becoming increasingly aware of the fact that soon there will be no more trucks of any capacity available for civilian use and that the potential mileage of those now in service must be guarded in the most scrupulous manner possible.

The extent to which the idea of preventive maintenance is penetrating the general trucking industry was demonstrated at a mass meeting called by a committee of truck owners and operators in Cincinnati, Ohio, late in August. At the close of the meeting, addressed by Mayor James Garfield Stewart, more than two hundred truck owners raised their right hands and repeated the ODT pledge. Then the official pledges were signed, and the owners received the official U. S. Truck Conservation Corps emblem to place on all their trucks.

The pledge is featured in the official U. S. Truck Conservation Corps booklet, "America's Trucks . . . Keep

'em Rolling," prepared as a guide to truck owners, drivers and maintenance men by automotive experts in the ODT's Division of Motor Transport. Copies of the booklet, which outlines, step by step, proven scientific methods for preventing excessive wear and unnecessary breakdowns, have been mailed to more than 2,550,000 truck owners from coast to coast. The booklet emphasizes the importance of regular inspections at intervals of 1,000-5,000, and 15,000 miles as the basis of proper maintenance. Such a schedule has been followed for years by most of the larger fleet operators and should be adopted as a practical measure by every truck owner in America.

Symbol of the U. S. Truck Conservation program is the red, white, and blue "decal" emblem, to be affixed to the right hand cab door of each truck whose owner has signed the ODT pledge. Here's how the plan works:

The owner signs the pledge and presents it at any official U. S. Truck Conservation Corps Station. These are designated by red, white, and blue "Official Station" posters, and include the establishments of truck manufacturers and dealers, tire dealers and oil companies and service stations. Upon presenting his signed pledge at any of these stations, the truck owner is given a "decal" for each of his trucks. Truck owners

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who are unable to find an official station in their immediate neighborhoods should get in touch with their truck, oil, tire, or parts dealer, who will direct them to the nearest station. A large number of leading manufacturers and distributors already have volunteered full cooperation in the program, and the list is growing daily.

Signing the pledge, the ODT emphasized, is merely the first step toward full participation in the preventive maintenance program. Nor does placing an emblem on the cab door of a truck constitute fulfillment of the obligation which the Nation's truck owners are being asked to assume as a patriotic duty. The emblem is merely the symbol of a continuing drive to keep America's trucks rolling with as few new parts and tires as possible so that the limited supply of raw materials and the manufacturing facilities may continue to be concentrated on production of guns, planes, tanks, and ships and the other materials of war.

In signing the Truck Conservation Corps pledge, the truck owner assumes a moral responsibility to prolong the life of every vehicle under his control by following certain specific procedures of modern automotive practice. Success of the program will depend on the extent to which those who own, drive and service the Nation's trucks cooperate.

Ten Thousand Road Workers in Indiana Train Against Sabotage and Raids

A statewide organization of approximately 10,000 state, county and city road and street workers is being trained for emergency duty in maintaining traffic arteries in the event of air raids, sabotage or other destruction of roads and streets. It was pointed out by S. C. Hadden, chairman of the Indiana State Highway Commission. Special training in emergency repairs of roads and bridges is being given all state highway employees in a series of meetings at the 36 field offices. These sessions, being attended by representatives of county highway and city street departments, include both classroom and field instruction. The State Highway Commission has been cooperating actively with the State Council of Civilian Defense in this program, furnishing engineers as instructors for district meetings and holding training sessions in the field offices. The program is being directed by Mr. Earl Cassidy, a member of the Commission's staff of engineers.

About Contractors and Their Jobs

Kansas City Area

REPORTED BY

PAUL L. MATCHETTE

George A. Ridgeway, for the past twenty years a senior Engineer with the Missouri State Highway Department, construction division, has been granted a leave of absence, and has been commissioned a Major in the U. S. Engineer Corps, Omaha, Nebraska, Division Office. The men in the Highway Department at Jefferson City, will miss George. He has a host of friends in the Construction Industry throughout Missouri, who will welcome him back when his assignment with the Government is completed.

Colonel Theodore Wyman, Jr., a well known and well liked engineer of the U. S. Engineer Corps, recently was given a D. S. M. in Washington. Several years ago Colonel Wyman was in charge of harnessing the Missouri River from its source near Ft. Peck, Montana to its mouth where it empties into the Mississippi River near St. Louis. Colonel Wyman did a creditable job in straightening the Missouri River from Kansas City to St. Louis and constructed a six-foot channel that has stood the test of several floods and dry spells. When Colonel Wyman left Kansas City he was promoted and sent to the West Coast. This was after he directed the construction of the Ft. Peck Dam in Montana near the headwaters of the Missouri River. At the time of the Pearl Harbor Attack, December 7, 1941, Colonel Wyman was District Engineer of the U. S. Engineer Corps at Honolulu. The Distinguished Service Medal, the army's highest award for non-combat service, was given to him. The order stated for, "Exceptionally meritorious service in emergency construction in the South Pacific area. Under extremely difficult conditions of supply and construction, Colonel Wyman completed the work two weeks ahead of schedule. He displayed unusual foresight, judgment and energy, and through his accomplishment rendered a service of great value to the defense of this and co-belligerent countries." While with the U. S. Engineer Corps in Kansas City, Colonel Wyman was advanced from Captain to Major, to Lieutenant Colonel and was promoted to Colonel

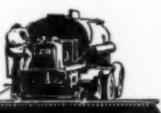
last December while on duty in Hawaii.

Burns and McDonnell Engineering Company, 107 Linwood Boulevard, Kansas City, Missouri, one of the outstanding consulting engineering firms of the Country, has been working steadily night and day for more than one year on defense and war projects, including the planning, engineering and overseeing the construction of army camps, air ports, and training centers. For many years they have maintained an office in Cincinnati, Ohio, under the direction of H. J. Rasson. Due to the heavy load that they have been carrying throughout the Southwest and to the difficulty of obtaining seasoned engineers, they have temporarily closed their Cincinnati office so that Mr. Rasson and his staff could help the Kansas City Office take care of the heavy work that they have on hand. They will serve both their Eastern and Western clients from the Kansas City Office.

One of the busiest men in Kansas City is Frank S. Gilmore, District Engineer of the Asphalt Institute, with offices in the Dwight Building, Kansas City, Missouri. The Kansas City District includes Missouri, Kansas, Colorado, Iowa, Nebraska, Wyoming and Montana. Frank is recognized throughout the Central West as one of the outstanding authorities on air port and highway construction. He is, perhaps, in touch personally with more jobs of this type throughout this part of the country than any other man in this section. Besides knowing his asphalts, and blacktop pavement, he is an expert on stabilized bases.

H. D. Barnes, former Chief Engineer of the Kansas State Highway Department, has recently been appointed District Engineer in charge of the Los Angeles office of the Portland Cement Association. All of his old friends among the State Highway Engineers and the contractors throughout Kansas are pleased to know of his promotion. Before joining the Kansas State Highway Department, in 1922, Hugh Barnes served as a private in the United States Army during the First World War. After that he was associated as a bridge designer with Ruckel Engineering Company at Garden City, Kansas,

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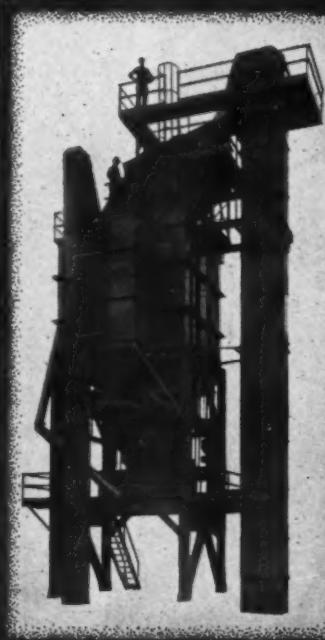


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and later became associated with E. T. Archer & Company, consulting engineers of Kansas City, on sewage and water jobs. Later on, he was County Engineer of Butler County, Kansas, located at Eldorado, the County seat. His progress in the Kansas State Highway Department was steady. In 1922 he joined the department as Resident Engineer. Later, he became Division Engineer, and then State Engineer of Construction, then Engineer in charge of Highway planning and then received the highest honor that the State Highway Department could give, and that was to become Chief State Highway Engineer.

As District Engineer for the Portland Cement Association, in Los Angeles, he has charge of Southern California, Arizona, and Southeastern Nevada.

The Kansas Industrial Development Commission has been especially active in helping the Army and Navy place war contracts in Kansas. According to reports by John Harvey, Field Representative, of the Commission, up to date the state had received a little better than \$1 1/2 Billion in war contracts. Texas was the only state in this area that exceeded this amount.

On August 2 at Sedalia, Missouri,

John S. Sweet, head of the Sweet Hotels, died. John Sweet was one of the best known hotel men in Missouri, Kansas, and Oklahoma. The Missouri Hotel at Jefferson City, Missouri, the state capital of Missouri, and The Kansan Hotel at Topeka, Kansas, state capital of Kansas, were operated by him. Both of these hotels are headquarters for the Missouri, and Kansas Highway Contractors. Besides operating these two hotels, he also operated the Tiger Hotel at Columbia, Missouri, The Bothwell Hotel at Sedalia, Missouri, The Atchison Hotel at Atchison, Kansas, The Capital Hotel at Topeka, Kansas, The Tioga Inn, Chanute, Kansas, and The Osage Hotel, Arkansas City, Kansas. Before coming to Kansas, John Sweet operated several hotels in Oklahoma. He was 79 years old when he died. He obtained his first hotel job when he was 16, working as a combination bellboy and porter in Lowell, Ohio. In 1921 he bought The Osage Hotel at Arkansas City. This was the first link in his Sweet Hotel chain. Mrs. Sweet died about six months ago. In 1922 and 1923, Mr. Sweet was president of the Missouri, Kansas and Oklahoma Hotel Men's Association.

Several months ago a tornado ripped through the center of Pryor,

Oklahoma, which has a normal population of 2500 and a floating population of approximately 5000. The town is now being rebuilt. Joseph L. Pohl of Nevada, Missouri, Lester and James Douglas of Springfield, Missouri, and Robert H. Dobson of Omaha, Nebraska, are the contractors doing the work.

Oscar M. Drake, one of the best road paving contractors in the State of Oklahoma recently resigned his position as general superintendent of the Lewis Construction Company, Muskogee, Oklahoma, to form his own company under his own name with offices in the Commercial National Bank Building, Muskogee, Oklahoma. Not only is Oscar an expert road construction man, but he is also an expert on the construction of waterworks and sewers. He has just recently been awarded a contract to build a new waterworks system for the city of Chouteau, Oklahoma. Oscar has a wide acquaintance throughout the Southwest and his many friends wish him success.

The Oklahoma Good Roads Association, headquarters Cotton Exchange Building, Oklahoma City, has done an outstanding job in the promotion of good roads and streets in

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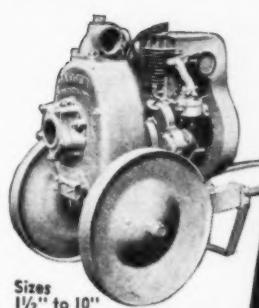


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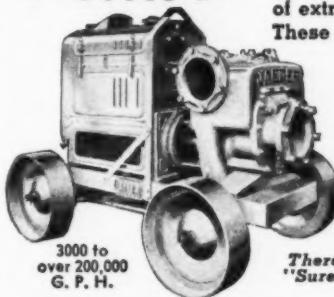


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expert advice on road construction, maintenance of streets and highway planning. The Association is doing fine work in the State and is greatly appreciated by the people and Government officials.

Personal Items About Engineers

William Canton, Klamath Falls, Ore., civil engineer, has been appointed county engineer on a part-time basis to succeed Frank Z. Howard, who resigned recently.

Lt. Col. Irvin Waldo Kenney, a construction engineer who worked for 20 years under the adjutant general's office at Camp Murray, near Tacoma, Washington, died suddenly in Ogden, Utah.

Capt. O. E. Schroeder, in charge of construction at the Klamath Falls, Ore., airport for the last year, has been transferred to the Redmond airport. Captain Schroeder came to Klamath Falls as a civilian engineer and was commissioned at the outbreak of war. At Redmond he will handle construction work at the municipal airport now under lease to the army. Of three runways planned there, one has been completed, another is now being constructed and work remains

to be started on the third. Extension of the completed runway beyond its present length of approximately a mile is contemplated.

Frank T. Young, Salem, Ore., Oregon City district resident engineer, has been appointed acting division engineer in charge of the Portland district, succeeding W. C. Williams, according to R. H. Baldock, Oregon state highway engineer. Williams has been granted a leave of absence to enter military service.

L. D. Conkling, head of Montana State college's civil engineering department, Bozeman, Mont., left Sept. 1 to accept a post in civil engineering at Kansas State college at Manhattan, Kan.

Conkling, a graduate of Cornell university, joined the Montana State college staff in 1914. He has often been engaged as tester and inspector for

state and federal construction projects in Montana, and was a member of the state highway commission from 1914 to 1917.

Charles M. Noble has received an appointment as Lieutenant Commander CEC-USNR. Commander Noble was with the Port of New York Authority for 13 years, served as Special Highway Engineer on the Pennsylvania Turnpike and for the past year has been with the War Department at Arlington, Virginia.

Blackout Traffic Light Devised By California Highway Department

A traffic light, developed by the California Highway Department, which cannot be seen by enemy airmen unless they descend to within 300 feet of the ground, has been ordered installed on California highways. The lights will continue to operate during blackout periods. The device consists of a metal cylinder, painted dull black inside and containing vanes which slant the light downward, which is fitted around the circular red, orange and green signal lenses. Anyone at an angle above the horizon can see no light.

New Equipment and Materials

Kaiser — Diesel Pioneer

Today practically all construction equipment is Diesel powered, but few

realize that Henry J. Kaiser, today's industrial genius, was largely responsible for its use in tractors and construction machinery in the United



Allis-Chalmers Monarch Tractor with Diesel Engine

States. As far back as 1929, the Kaiser Paving Company, one of the many Kaiser organizations, in co-operation with Allis-Chalmers, converted four of their Allis-Chalmers Monarch gasoline tractors to Diesels, by the addition of an Atlas Diesel engine and thus became the first to employ this form of tractor power.

Today Kaiser is one of the country's largest users of construction equipment, all operated by the type of power he helped pioneer.

Remote Control for Welders

The Hobart Brothers Co., Troy, Ohio, has developed a remote control unit which is now a standard production feature of all welders offered for sale by the company. This improved control is protected fully from accidental breakage by a metal pull-out handle set over the control dial and by cushion springs on the back of the porcelain rheostat. The new dial, it is believed by the manufacturers, will increase weld qualities, especially welds made under modern high speed techniques. Remote control places 100 steps of fine volt-amperage adjustment right within reach of the operator's hand. The unit is easily set up

Renewable TRACTOR RIMS

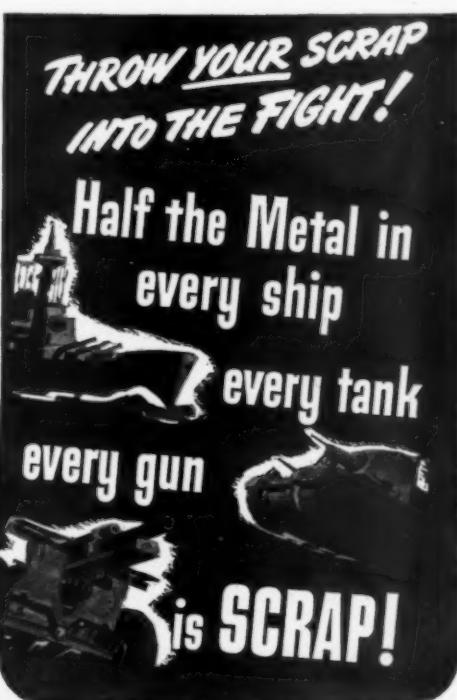


These wear-resistant, heat treated steel rims are easily installed, at lower cost, on the original tractor wheels, conserving needed war metal. Welding instructions furnished. Write for bulletin.

ALLOY STEEL & METALS CO.

1862 E. 55TH ST. LAFAYETTE 0181 LOS ANGELES, CALIF.

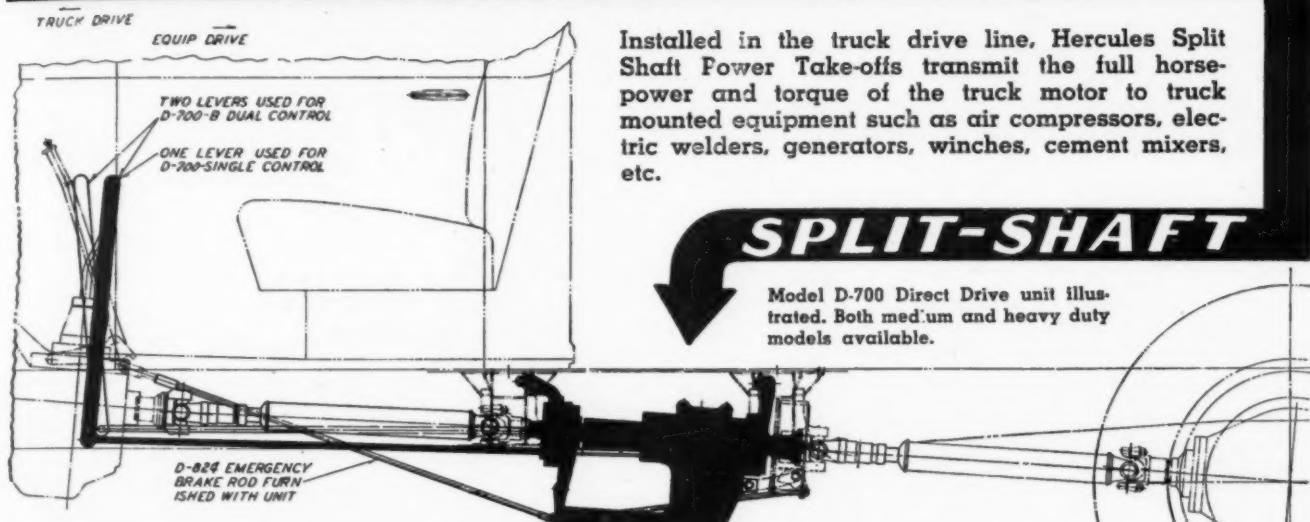
Manufacturers of PACIFIC CRUSHING & SCREENING UNITS • PACIFIC SLUSHING SCRAPERS & SHEAVE BLOCKS • ALLOY-MANGANESE MILL LINERS & CRUSHER JAWS • PACIFIC ROCK BIT GRINDERS • HAND WINCHES • CRAWLER SHOES, TRACTOR RIMS and other Wearing Parts



★ Available now on rated priorities for Caterpillar Tractor equipment engaged in the War Effort. Due to the unusually heavy demands on our production facilities, requirements should be anticipated well in advance.

YOU CAN HELP BY SALVAGING YOUR WORN RIMS PROMPTLY

HERCULES POWER TAKE OFF



Installed in the truck drive line, Hercules Split Shaft Power Take-offs transmit the full horsepower and torque of the truck motor to truck mounted equipment such as air compressors, electric welders, generators, winches, cement mixers, etc.

SPLIT-SHAFT

Model D-700 Direct Drive unit illustrated. Both medium and heavy duty models available.

Hercules Split Shaft Power Take-offs are easily installed in all standard truck chassis, enabling one truck motor to do the job of two power units.

HERCULES STEEL PRODUCTS CO. GALION, OHIO



Remote Control Unit

by using an ordinary lamp cord extension to connect it to the machine.

Osgood Announces New 805WM Mobilcrane (Wide Gauge)

The new Osgood 805WM Mobilcrane is the latest addition to the Osgood line of one-man, one-engine operated cranes mounted on pneumatic rubber tired wheels. All operating functions of the machine are controlled by air power. Independent travel, independent boom hoist, extra wide chassis, 18 rubber tired wheels, hydraulic steering, and air brakes are advanced features that give the 805WM Mobilcrane the ability to get

the job done quickly, efficiently, and economically, according to the manufacturers, the Osgood Co., Marion, Ohio. The extra width of the chassis, and the use of 18 wheels, (12 at the rear, 6 at front) make it possible to lift loads up to 30 tons over the side of the machine as well as the ends, and carry the load to the desired location.

The tandem rear wheel drive unit

is arranged to oscillate up and down. The front axle carries three wheels on each side, with the axle suspended in a saddle block. The Mobilcrane is steered through the use of a double acting hydraulic cylinder attached to the front axle, and which slews the axle in the desired direction.

Brakes are operated by air, and can be set with the cab in any position over the wheels. The boom is avail-

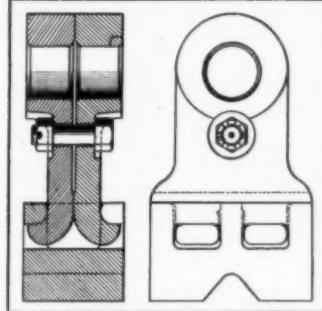
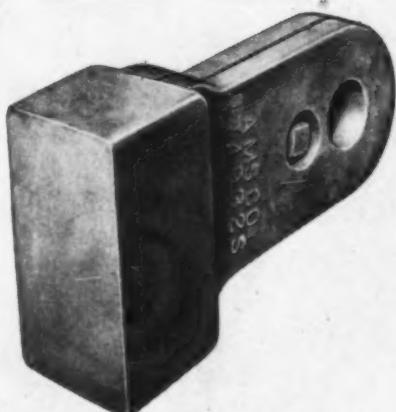


805WM Mobilcrane (Wide Gauge)

able with variable length inserts, and is equipped with a telescopic back-stop. The swing and travel clutches on the horizontal reversing shaft in the upper body are operated by Twin Disc clutch, and controlled by air. The independent boom hoist is mounted in the upper part of the gantry, and is operated by two large Twin Disc clutches. The Model 805WM Mobil-crane is also available with a standard weight chassis, and only 12 wheels, for use in narrow or confined quarters.

Three-Part Pulverizer Hammer Features Economy

The Clark renewable tip pulverizer hammer (patent applied for) announced by the American Manganese Steel Division of The American Brake Shoe & Foundry Co., Chicago Heights, Ill., is really a child of the times for metal conservation is its design feature. The hammer consists of a weighted manganese steel head connected to the rotor by two matching arms or bars of manganese steel. On the lower end of each bar are hooks which engage internal pockets in the head. The bars are bolted together



New Closed Type Hammer: Complete weight 110 lb., bars 57½ lb., head 52½ lb., worn bars 57 lb., head 16½ lb. Line drawing shows method of securing head on bar hooks and bolting of bars to form a one-piece arm

under the eye so that they form a one-piece arm; yet they are easily disengaged from the service worn head by unbolting. It is claimed that this new design has six distinct advantages among them: great saving in weight of discarded parts; no operating stress is imposed on shank bolt used for assembling; no metal is lost by too early discarding of heads as the maximum use is indicated when lower ends of arms are visible.

STRIKING POWER

to penetrate the enemies defenses or to penetrate the toughest materials being excavated. Both are essential for successful operations. Versatility is an old Owen attribute and specially hardened teeth of various types can be readily adapted to many Owen Models to increase digging efficiency. To realize the most on your bucket investment, investigate Owen teeth and attachments.

THE OWEN BUCKET COMPANY • 6070 Breakwater Ave., Cleveland, Ohio
BRANCHES: NEW YORK, PHILADELPHIA, CHICAGO, BERKELEY, CALIF.

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A MOUTHFUL AT EVERY BITE

ASPHALT and TAR KETTLES

FIRE PROOF—OIL BURNING
Hand and Motor driven spray.
Many sizes. Write for catalog.

Elkhart White Mfg. Co. Indiana

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For Access Road and Air Base Construction

PORTABLE CRUSHERS

Proper Size Aggregates--on the Job

Balanced, Non-Tipping. Expertly designed to meet your exact requirements in proper size aggregates—larger capacity and quick mobility to and from job.

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2915-21 N. Market St., St. Louis, Mo.



Four Wheel Maintenance JAW CRUSHER with Power Unit

Write for Catalog
No. 601

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deliver High Yardage at Low Cost

More productive time on the job, and high-speed operation without operator fatigue. . . . Lowest maintenance costs because of advanced design and construction. . . . 25 m.p.h. road speed cuts travel-time between locations. Quickly converts to Crane, Clam, Dragline or Trench Hoe.



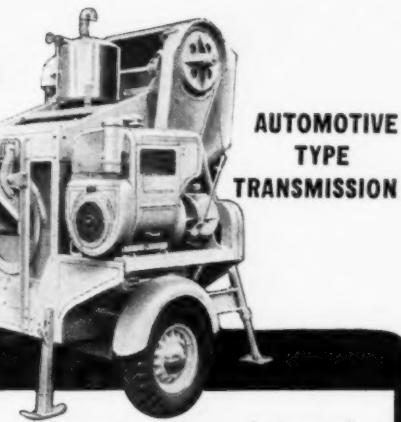
Learn how MICHIGAN mobile SHOVELS could help make your jobs pay bigger dividends — write TODAY for Bulletin S.

MICHIGAN America's Mobile Shovel-Crane Specialists
MICHIGAN POWER SHOVEL CO.
BENTON HARBOR, MICHIGAN

New Service Trencher

Describing in detail the Buckeye Model 12 service trencher and picturing interestingly the various types of jobs on which the machine can be employed, the Buckeye Traction Ditcher Co., Findlay, Ohio, is now distributing a four-page bulletin on the Buckeye Model 12 service trencher. Among others, the following are some of the features, the manufacturers point out, typical of the advance engi-

neering that has gone into this trencher: four-point suspension of digging wheel; constant center drive; clutch protects transmission by serving both as a throw-out and a friction safety; digging speed control, and avoidance of spill back through use of arcuate conveyor. The crawlers are independent of each other, one side can be driven while the other side remains stationary, making it easy to follow the trench line and make short



Built to MIX FASTER RUN SMOOTHER, QUIETER, LONGER



Put a Jaeger on the job and get those profits slower mixers can't produce. Load faster with Automatic Skip Shaker, mix more thoroughly with Criss-Cross Action, discharge faster than any other mixer on market. Drums roll on machined tracks, chilled ball bearing rollers. Transmission runs in oil. All sizes run easily on Timken bearings.

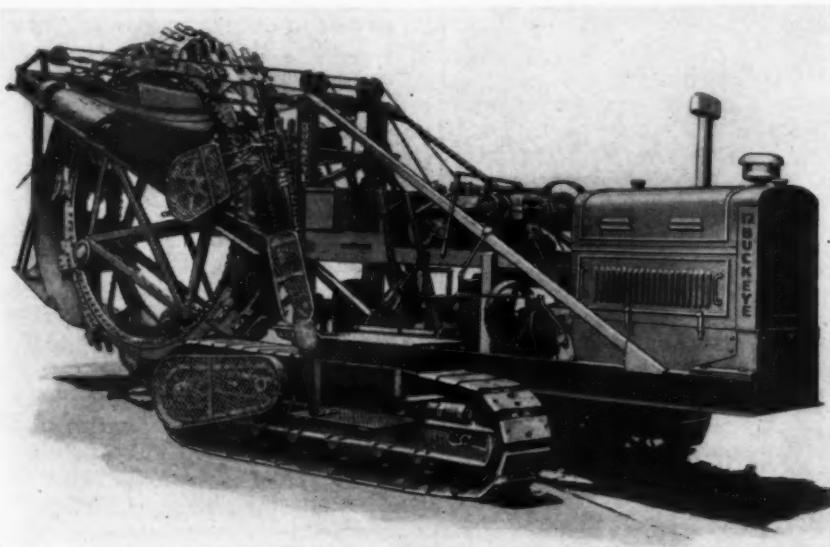
Send for Catalog. Compare Prices
THE JAEGER MACHINE CO.
223 Dublin Avenue, Columbus, Ohio
World's Biggest Manufacturer of Concrete Mixers, All Types, Sizes to 56S.

JAEGER SPEEDLINE

radius turns. A copy of the Bulletin may be had by writing to The Buckeye Traction Ditcher Company, Findlay, Ohio, asking for Bulletin No. 7426M, Buckeye Model 12 Service Trencher.

New Welder Trailer

To aid in conserving rubber for direct war needs, Harnischfeger Corporation of Milwaukee, Wis., has announced the immediate substitution of an all-steel wheel portable mounting on its P&H gas engine-driven welders for the rubber-tired trailer. The new trailer is of the 2-wheel type, equipped with an axle and heavy duty springs, and suitable for field work and highway towing. The wheels have a 24-in. diameter and 4-in. rim face, and are designed to permit quick changeover to a pressed steel wheel with pneumatic tire when available later. The towing bar and trailer rest have not been changed. To compensate for the harder riding of steel rimmed wheels, the new unit is built for heavy duty in every way, with a 9-leaf spring as well as extra heavy axle. The new steel-wheel carriage is now being put on all portable gas engine welder shipments. This includes all Army, Navy, and Lend-Lease orders, unless specif-

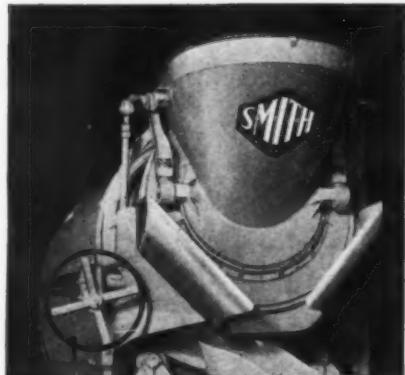


Buckeye Model 12 Service Trencher

ically stipulated that rubber tires are essential. The welding range of P&H gas engine-driven models is from 15 to 370 amps.

Self-Aligning Feed Chute On New Smith-Mobile

Smith-Mobile truck mixers and agitators, manufactured by The T. L. Smith Company, Milwaukee, Wis., are now furnished with a self-aligning combination feed chute and closing door support. It eliminates the need for manual adjustments and assures smoother operation. A uniform contact between the revolving sealing



New Smith-Mobile Self-Aligning Feed Chute



Make Snow Plowing and Cinderering Safer

INSTALL Keystone Snow Plow Lights On Your Trucks

While We Can Still Deliver Before Snow Starts

CUT DOWN ACCIDENTS
MAKE YOUR HIGHWAYS SAFER

FULL INFORMATION AND SAMPLE AVAILABLE
UPON REQUEST ON YOUR LETTERHEAD

AUTO GEAR & PARTS COMPANY

1410 W. Hunting Park Ave.

Philadelphia, Pa.

ring and mixer drum is established throughout the entire 360 degree surface, thereby compensating for whatever misalignment results from the weave in the truck chassis. In addition, the new design provides a self-cleaning feature. Grout which might work past the seal cannot possibly get into the bearing surface in which the sealing ring rotates.

Cement Dispersing Agent for Paving Concrete

The Master Builders Company of Cleveland, Ohio, has recently placed on the market a cement dispersing and air entraining agent known as HP-7 which, when added to a paving mix, is claimed to improve all the essential qualities of concrete—transverse strength, resistance to wear, freedom from scaling. Furthermore, it appears that this is accomplished with little or no increase in cost, and in some cases with an actual reduction.

HP-7 is essentially a combination of an air-incorporating agent (sodium lauryl sulphate) with a cement-dispersing agent (a derivative of lignin sulphonate acid).

Maximum dispersion of cement in the mix has long been recognized as necessary to the attainment of maximum strength and economy. The introduction of air however, is a newer development which is not so generally known or understood. In fact it is actually contrary to the preconceived ideas of many people. Space does not permit discussion of this subject beyond the statement that small amounts of entrained air permit the use of lower water-cement ratios, reduce bleeding, and appear to add to the durability of the product—especially as regards scaling.

The manufacturer points out that as HP-7 is a mixture of definite compounds in definite proportion, its use is subject to perfect and complete control. It is noted also that while these ingredients can be used separately, and each is effective in its own way, it is only by the combination that the fully beneficial effect is attained.

A 24-page pamphlet entitled, "Cement Dispersion and Air Entrainment in Concrete Pavement Construction," by Edward W. Scripture, Jr., Director of the Master Builders Research Laboratories, is available from the manufacturer. It contains a detailed and partly technical account of the character, development and use of HP-7, and of other products intended for the same ends; and includes reports of tests on various ordinary and special concretes at 3, 7, and 28 days.

With the Manufacturers

Worthington Appoints R. J. Laidlaw Manager of Its Cleveland Office

Worthington Pump and Machinery Corporation announces the appointment of Mr. R. J. Laidlaw to the position of Manager of its Cleveland district office. Mr. Laidlaw will succeed Mr. A. J. Klug who will now devote his entire time to special work with certain important industries in the Cleveland district.

Mr. Laidlaw has been connected with the Worthington organization in various capacities since his return from overseas in 1919 from active service with the 32nd Division of the 120 M.G. Battalion in World War I.

New Company to Handle J. D. Adams' Distribution in Montana and Wyoming

J. D. Adams Company, Indianapolis, Ind., announce that sales and service, in Montana and Wyoming, of their equipment, motor graders, leaning wheel graders, elevating graders, hauling scrapers, tamping rollers, etc., will be handled by the Industrial Equipment Co., 2313 First Ave., N., Billings, Montana.



W. C. Hardie

With the establishment of this new distributorship the Adams Billings Branch will be discontinued. W. C. Hardie, the Adams Billings Manager for several years, is Vice-President and General Manager of the new firm.

Kinney Closes Dallas Office as H. A. Perry Enters U. S. Service

The Kinney Manufacturing Company of Boston announces the closing of its District Office at Dallas, Texas, on August 15th because of the fact the manager thereof, Mr. H. A. Perry, Jr., has resigned to enter the U. S. Ordnance Department. All correspondence from the district formerly handled by the Dallas Office will be handled from the nearest office or the Home Office in Boston, Massachusetts.

K. C. Frazier Is New York Dis- trict Sales Manager for Columbia Chemical Division

W. I. Galliher, Director of Sales, Columbia Chemical Division, Pittsburgh Plate Glass Company, made the announcement recently of the appointment of K. C. Frazier as District Sales Manager of the New York Met-



K. C. Frazier

ropolitan area.

Mr. Frazier is a graduate of Colgate University and a member of the Delta Kappa Epsilon fraternity. For the last ten years he has been Southwestern Manager of the Southern Alkali Corporation,

an affiliate of the Pittsburgh Plate Glass Company.

STRENGTH

*... to finish whatever it starts.
... to rip through toughest going.
... to ram the dipper deep into the bank.
... to resist twisting and fracturing.
... to absorb shock loads.
... to pile up profits for you.*



When equipment breaks down, production schedules are knocked into a cocked hat and profits fly out the window.

That's why Byers builds shovels and cranes to "stand up and take it." Open hearth castings, uniform rolled steel sections, annealing, heat treating, anti-friction bearings, balanced design

all contribute to Byers' reputation for building sturdy shovels and cranes.

This is another reason why you should investigate Byers 3/8 to 3/4 yd. sizes.

Modern CRANES and SHOVELS

BYERS

RAVENNA, OHIO

Welch Named President of Magneto Firm

The board of directors of Eisemann Magneto Corporation announced the election as president of Howard S. Welch. He also was elected a director. For more than 20 years Mr. Welch has been identified with the automotive and aircraft industries. In addition to his present duties, Mr. Welch also will serve as director and president of Airward Corporation, which is engaged in the development of special duty magnetos for high output aircraft engines.

Michigan Alkali Moves

The general sales offices of Michigan Alkali Company have been removed to Wyandotte, Michigan. The new mailing address is Post Office Drawer 472, Wyandotte.

U. S. Engineers Get 25,000th LeTourneau Power Control Unit

Heavy duty power control unit No. 25,000-R8C came off the assembly line July 25 at the Peoria, Ill., plant of R. G. LeTourneau, Inc., was painted Army green and is now in active



Harold Feldman, Al Unruh, and Harley McKaw, of the Power Control Unit Assembly line are mighty happy about the 25,000th LeTourneau Power Control Unit. This unit is the Heavy-duty R8 model

service on a "Caterpillar D8 tractor and LeTourneau Bulldozer with the Army Engineers. The power control unit transmits tractor power through cable for the operation of earthmoving and construction equipment. Just 18 months ago the 15,000 PCU was shipped to a West Coast LeTourneau-Caterpillar distributor.



for Better Roads and Streets

BITUVIA is easily and quickly applied—an important consideration in the many emergency road construction and repair jobs today. BITUVIA penetrates deeply and holds the aggregate firmly, insuring long service and economical maintenance. The BITUVIA surface is highly resilient and skid-resistant. Made in seven types to meet any Federal, State, County or Municipal specifications.

PLASTUVIA CRACK FILLER

PLASTUVIA is a waterproof coal tar filler which bonds firmly to brick and concrete, permanently filling and sealing cracks and openings to prevent water damage. Will not flow or "pull" in summer, nor chip in winter.

Further information on request.



REILLY TAR & CHEMICAL CORPORATION

Executive Offices: Merchants Bank Building, Indianapolis, Indiana
2513 S. DAMEN AVENUE, CHICAGO, ILLINOIS. 500 FIFTH AVENUE, NEW YORK, N. Y. ST. LOUIS PARK, MINNEAPOLIS, MINN.
SEVENTEEN PLANTS TO SERVE YOU

Ransome Machinery Company

Effective immediately, the former Ransome Concrete Machinery Company, Dunellen, New Jersey, will be known as the Ransome Machinery Company.

The company will continue to manufacture the same products with which it has been identified in the past. These products include 34-E Single and Dual Drum Pavers, Truck Mixers, Central Plant Mixers and Small Mixers. No changes in the management personnel have been made.

Cummins Regional Office Enlarged

The Cummins Engine Company, Columbus, Ind., has enlarged its regional offices at Fort Worth, Tex. Formerly located in the Mid-Continent building, the company has taken larger quarters at 1812 Fair building, where J. B. Chambers, Regional Manager, will be in a position to facilitate the handling of all sales and service matters through the distributors, the Mid-Continent Supply Company and the Cummins Diesel Sales and Service Company, Inc.

Mr. Chambers is well known in the Mid-Continent territory, having been appointed Regional Manager at Fort Worth in 1935. Affiliated with the Cummins Company since 1925, he got his diesel training in various capacities at the Cummins factory.

**J. T. Callahan Western District
Sales Manager of
B. F. Goodrich Co.**

J. T. Callahan, with The B. F. Goodrich Co. since 1928, has been named western district manager of the company's national sales and service division with headquarters in Chicago, Ill., it is announced by G. E. Brunner, general manager of that division. Mr. Callahan succeeds Walter W. Thomen, western district manager since 1939, who has been called to active duty as a major in the office of the Chief of Ordnance, War Department. Callahan joined B. F. Goodrich in Oklahoma City and served in sales capacities in Dallas, Texas and New Orleans, La., before being transferred to Akron, Ohio, in 1938. Until his new appointment, he had been engaged in special work in the company's production of war products. He is a veteran of the first World War and is a private pilot of many years' experience.

New President of Marmon-Herrington Well Known in Industry

One of the well known and colorful figures in the American automotive industry, Bert Dingley, of automobile



Bert Dingley

racing fame in the days of the old barnstorming road races, and later associated with such pioneer manufacturers as Marmon and Stutz, is now president of a company which is building millions of dollars worth of war equipment for the United Nations. This is not Bert Dingley's first association with war production," says A. W. Herrington, chairman of the board of directors of Marmon-Herrington. "During the World War he was chief inspector of Liberty Motors, stationed with the Nordyke and Marmon Company at Indianapolis. Then, and in other jobs since, he established a record for 'hard nosed' efficiency which is belied only by the large following of loyal workmen and executives he has taken with him in his steady advancement in the industry."

It has been Dingley's job, ever since this war started, to keep the wheels turning in the big Marmon-Herrington plant, and to keep the trucks, armored cars and tanks rolling out in the ever increasing volume demanded by America and her Allies, while Art

Herrington made the contacts with government officials and conceived the vehicles his company turns out.

Brooks Toler Becomes Forester for Southern Pine Association

On Aug. 29, H. C. Berkes, Secretary-Manager of the Southern Pine Association, announced that Brooks Toler, State Forester for Alabama since 1939, has tendered his resignation to Governor Frank Dixon to accept the position of forester for the Southern Pine Association. Mr. Toler will take over his new duties on Octo-

ber 1. He is 36 years of age, a native Louisianian and a graduate of the Louisiana State University's School of Forestry, having obtained his B.S. degree in 1928. Following his graduation he became affiliated with the American Forestry Association and later held the office of district forester in Mississippi. He next served as extension forester in Mississippi until 1939, when he was called to Alabama by Governor Dixon.

Among the highlights of Mr. Toler's accomplishments in Alabama were the construction of 38 new fire towers throughout the state; the addition of



AMCRECO Creosoted PILES and TIMBER

**bring Long Life, Economy
and Reliability to every
type of Construction Project
where timber can be used**



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ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

425 miles of telephone lines for use in forest fire control; the acquisition of three CCC camps in the state to promote forestry and conservation. When Mr. Toler went to Alabama the number of individuals engaged in a cooperative program of fire control was 110. He leaves his office with the number increased to nearly 5,000.

Mr. Toler's headquarters will be at the home office of the Southern Pine Association in New Orleans but he will spend much time traveling among the mills and visiting with state and federal forestry groups. His successor in Alabama has not yet been chosen.

New Trade Literature

Highway Transportation in World War II.—To promote better understanding of the importance of highways and highway traffic in our war program, and to provide basic statistics on roads and the people and vehicles using them, National Highway Users Conference, National Press Bldg., Washington, D. C., has issued

a unique little volume in which each salient point is presented on a single page of ten to two score words. Subject matter is divided by tab index sheets into four parts—Highways, Vehicles, Services, Manpower.

Pointers on Rebuilding and Hard-Facing Construction Equipment.—A booklet compiled by the Stoody Company giving suggestions for extending the life of new equipment and reclaiming all types of worn equipment through use of Stoody products. A copy may be had by writing the Stoody Company, Whittier, Calif.

Pumpcrete.—A new 24-page catalog descriptive of the 1942 models of the Rex Pumpcrete has been published by Chain Belt Co., Milwaukee, Wisc. It presents technical data explaining how to operate, how to set-up a Pumpcrete system, and also interesting pictures of jobs that the Pumpcrete is doing or has already done. In it also are complete specifications and dimensions for all of the various size machines.

Chart on Air Compressor Care and Servicing.—Designed to assist compressor owners in conserving their equipment, a new service chart on air compressor care and servicing has been prepared by the Quincy Compressor Co. Seven simple rules include detailed instructions on lubrication of the compressor; care and cleaning of air intakes and muffler; checking of safety valves. Other instructions deal with valves, valve seats, bearings and rings. General service information is given on air tanks and electrical equipment. Part of the chart is devoted to costly air leaks and their elimination. Copies can be secured without charge by writing the Quincy Compressor Co., Quincy, Illinois.

Sand-Asphalt Construction Specification Issued by Asphalt Institute.—A specification covering the construction of the hot-mix type of sand-asphalt base and surface courses has been adopted by the Asphalt Institute and promulgated as its "Specification A-5." Copies are available, without charge, upon request to the Asphalt Institute, 801 Second Avenue, New York, N. Y.

Machines for Processing Sand and Gravel.—Three new catalogs have been issued by the Eagle Iron Works, Des Moines, Iowa. One catalog covers their crushing and grinding equip-



SCHRAMM . . . a name that stands behind the product! A product that is aiding your Uncle Sam to build the best Army and Navy in the World. You'll find SCHRAMMS everywhere because owners have found that their Longlife . . . Lightweight . . . Compact Dimensions . . . Automatic Controls . . . Efficiency . . . and Flexibility mean profitable contracts. SCHRAMMS are either gasoline, diesel or

electric powered and are built in sizes 20, 50, 60, 85, 105, 210, 315 and 420 cu. ft. per minute of actual air delivered.

ALL SCHRAMMS are water-cooled for heavy duty work under all weather conditions, providing the same degree of uniformity in cooling, either in extreme hot or zero weather.

Choose SCHRAMM, a product worthy of its name.

Write for Catalog 42-P

SCHRAMM THE COMPRESSOR PEOPLE

SCHRAMM, INC., WEST CHESTER, PA.

ment. They have developed a shale planer, a double roll crusher, a grinder, a nine-foot dry pan, an eight-foot duplex wet pan and a nine-foot wet pan. The planer planes clay and shale from the face of a bank and gathers raw material, and is claimed to reduce costs substantially. While it is not adapted to all conditions, it has definite advantages where a reasonably high shale or clay bank exists. One case is cited where complete labor cost of excavating clay and transporting it to storage shed at the plant in connection with the planer was only \$0.0543 per ton. Only five men were employed and they handled 400 tons at a total labor cost of \$21.75 for a nine hour day, according to the report.

The second catalog deals with sand and gravel washers and crushers. The manufacturer makes a specialty of meeting highway specifications, and the bulletin carries testimonials from various highway commissions and sand and gravel companies. Water for the washers is introduced from a multiplicity of small holes extending along the washing length of the tub, decreasing in size toward the upper end. Foreign material is removed from the aggregate by means of an upward current of water from the bottom inlets as it is conveyed up to the material discharge end, thus taking advantage of the difference in the specific gravity of foreign material and the aggregate. At the same time the material is subjected to an abrading action by both the screw and bent bar agitators the pieces rubbing one against another with a scrubbing effect and the rising current carrying away foreign material.

The third catalog describes a suction screen nozzle ladder for sand and gravel pump dredge operators. It is used as a device for suction pipe lines to overcome delays due to stoppage by oversized materials, particularly at the nozzle openings, and as an agitator for loosening the deposit to insure an even flow of solids through pipe line system.

Copies of any or all of these booklets can be obtained by writing Eagle Iron Works, Des Moines, Iowa.

Splicing Wire Rope—Correct Handling of Wire Rope—Socketing Wire Rope—Rope Dope.—Considering the size of sheave or drum, shall the construction be 6 x 7, 6 x 19, 8 x 19, 6 x 37 or one of the many other stranding combinations? Shall the specification be Warrington, Seale or filler wire type? Shall the steel specification be cast steel, mild plow steel, plow steel or improved plow steel? Shall the cen-

ter or core be hemp, strand or independent wire rope? Shall the lay be regular or Lang? Right or left lay? What equipment can use preformed wire rope with saving and more safety?

The above questions are answered in 3 interesting booklets and a series of educational bulletins published by Union Wire Rope Corp. The bulletin is called "Rope Dope," and considers the selection of the proper wire rope for a particular piece of equipment. It outlines five successive steps necessary to determine the correct wire rope for replacements. Step number one is to determine proper size of rope

by measuring grooves in sheaves and caliperizing size of rope because new wire ropes are usually made somewhat oversized. Step number two is to measure tread diameter of smallest sheave or drum. Step number three is to determine the type of construction. Engineers have figured the critical diameter of the various constructions of rope in relation to the size of the sheave as well as the diameter of the rope, and a table shows the critical diameter and minimum diameter for the various constructions. Step number four gives a table of the grade of steel required for strength, safety and wear. Step number five concludes with

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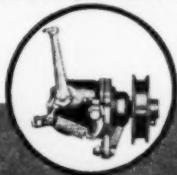
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ROADS AND STREETS, September, 1942

the length of the rope and whether the rope should be regular or Lang and whether right or left lay.

"Correct Handling of Wire Rope" is a small booklet dealing with storage, rewinding, and seizing. It also gives detailed directions for attaching mandrels and sockets, and it tells how to set up a reel properly for rewinding and how to fasten the end of the rope to the reel.

"Socketting Wire Rope" is a small booklet giving 8 different methods of socketting, and definitely showing which method is the best from actual tests to determine the rope's breaking strength. These tests show at what point the rope started to pull out of the mandrel, and at what point it ultimately failed. With the best method, the rope did not pull out, but failed at 100% of the rope's strength. Detailed directions for attaching mandrels and sockets are given. The booklet is profusely illustrated.

"Splicing Wire Rope" is the third booklet. It gives directions for splicing an eye into the end of a wire rope. It also tells how to make a "rolled in" eye splice. The making of an endless or long splice in wire rope is illustrated and described in five steps. Tucking the ends, splicing six stranded ropes with independent wire rope center, and splicing eight stranded ropes are some of the other operations for which directions are given. Making a wire rope grommet is illustrated in five figures and very clearly explained. Efficiencies of wire rope attachments are also given.

Copies of the above booklets and bulletin can be obtained by writing the Union Wire Rope Corp., 21st and Manchester Avenue, Kansas City, Missouri.

"Moments in I-Beam Bridges": The studies reported in Bulletin No. 336, "Moments in I-Beam Bridges," by Nathan M. Newmark and Chester P. Siess, which has just been issued by the Engineering Experiment Station of the University of Illinois, were undertaken in an attempt to obtain a better understanding of the behavior of the type of structure commonly called the I-beam bridge, consisting of a concrete slab continuous over steel beams. This type of structure is so simple in appearance and so conveniently constructed that it has found widespread use for highway bridges. Consequently, an investigation of the action of this type of bridge with a view toward development of better design methods appeared desirable. The data contained in this bulletin are based entirely on analytical considerations, and ap-

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ply to simple-span right bridges consisting of slabs supported by five identical parallel beams, uniformly spaced. Moments are determined at various points in the slabs and in the beams for different positions of a concentrated load on the structure. The flexibility of the beams is taken into account in the analysis. Influence values for moment are given for a group of structures of various proportions and of different relative stiffness of slab and beams. From the influence values moment coefficients are determined for a number of bridges of different span lengths subjected to standard highway truck loads. General relations bearing on the design of I-beam bridges are derived from the results of the analyses. The numerical values of moment coefficients are generally applicable also to structures with concrete instead of steel beams, as well as to structures with steel beams anchored to the concrete slab by means of shear connectors. Until January 1, 1943, or until the supply available for free distribution is exhausted, copies of Bulletin No. 336 may be obtained without charge upon application to Engineering Experiment Station, Urbana, Illinois.

Compressors: An attractively colored and profusely illustrated 12-page booklet describing and picturing the various types of Schramm compressors, and the construction tools recommended for use with the Schramm Fordair compressors, has been prepared and is now being distributed. A copy may be had by writing to Schramm, Inc., West Chester, Pa.

Diesel Engine Lubrication: A new service bulletin on Diesel engine lubrication has just been prepared by the Kendall Refining Co. The booklet discusses in semi-technical terms the design and construction of Diesel engines and points out in what ways the Diesel engine differs in its lubrication requirements from other types of internal combustion engines. The text further outlines the current concept of high speed Diesel engine lubrication. A copy may be had by writing to the Kendall Refining Co., Bradford, Pa., and requesting Service Bulletin No. 19, Diesel Engines and Their Lubrication.

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in making whiteprints. Engineers and draftsmen may obtain a copy of this new booklet by writing to the Ozalid Products Division, Johnson City, N. Y.

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*Williams Form Engineering Corp.	—
*Wisconsin Motor Corp.	—
Wood Preserving Division Koppers Co.	7
Worthington Pump and Machinery Corp.	—
Y	
York Modern Corp.	—

* Advertisers with * are represented in the 1942 edition of Powers' Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.

which would **YOU** rather handle?

ORDINARY

Non-preformed

TRU-LAY

Preformed

• We hope you have never had a lost-time accident due to wire rope. Some operators have—and *this* is no time to have workmen laid up with a blood-poisoned hand. Some operators have drastically reduced compensation claims by adopting American Cable **TRU-LAY PREFORMED**—the *safer* rope. . . . Being preformed, American Cable **TRU-LAY** is tractable—flexible—easy to handle. It resists kinking and snarling. Worn or broken crown wires lie flat and in place—refusing to wicker out to puncture hands or tear clothing. . . . Furthermore, being preformed **TRU-LAY** will last longer than ordinary cable. It has far greater resistance to bending fatigue. That means reduced machine shutdowns for replacement—steadier production—greater dollar value. . . . All American Cable ropes identified by the Emerald strand are made of Improved Plow Steel.

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Detroit, Denver, Los Angeles,
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AMERICAN CHAIN & CABLE COMPANY, Inc.

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ESSENTIAL PRODUCTS . . . AMERICAN CABLE Wire Rope, TRU-STOP Emergency Brakes, TRU-LAY Control Cables, AMERICAN Chain,
WEED Tire Chains, ACCO Malleable Iron Castings, CAMPBELL Cutting Machines, FORD Hoists and Trolleys, HAZARD Wire Rope,
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READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*



Safeguard an important national asset **YOUR HIGHWAYS**

Here's one way: "*Keep your shoulders up!*"

With new highway construction cut to a minimum by the war, it's doubly important that we protect and prolong the life of the highways we have.

One way the highway official can help achieve that important end is by keeping a watchful eye on his highway shoulders.

Keep shoulders graded up even with the surfaced portion of the road. That protects the edges of the surface from damage by traffic, when it swings out to ride the shoulder and returns again to the surface.

Keeping shoulders up also prevents rain water from collecting and working in under the edges of the surface.

Normally, the ideal shoulder for highway surfaces of every type is provided by a low-cost asphalt mix. As a temporary expedient during the war emergency, use



Good example of a highway with shoulders graded up even with edges of pavement. View of Highway No. 87 in Bexar and Kendall Counties, Texas, paved with Texaco Asphaltic Concrete.

a grader as often as necessary on earth, gravel, sand-clay and similar shoulders, so that the edges of all highway surfaces are properly protected.

Safeguard the highways you have! Watch your shoulders!

THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd St., New York City
Philadelphia Richmond Boston Chicago Jacksonville Houston



TEXACO ASPHALT